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VIDEO AUTOMATIC TARGET TRACKING SYSTEM (VATTS) OPERATING PROCED--ETC(U)

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(6) VIDEO AUTOMATIC TARGET TRACKING SYSTEM (VATTS)
OPERATING PROCEDURE

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FOREWORD

This document provides a detailed description of the VATTS, procedures for its employment in data collection, and start-up and shut-down procedures. It is intended to be used as a detailed guide for hands-on users of VATTS. This document was edited by Mike Hanley and its authors, from BDM, Ft. Knox, are as follows:

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DABT23-81-C-0240

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A. BACKGROUND

The Video Automatic Target Tracking System (VATTS) is an integrated hardware and software system designed and manufactured for the US Army Armor and Engineering Board (USAARENBD), by DBA Inc. Melbourne FLA.

The VATTS is used to collect azimuth, elevation, and range information from a cooperative target, (vehicle mounting a laser-retro-reflector and light).

VATTS is composed of six (6) major subsystems:

(1) Trailer system
(2) Tracker system
(3) Optical subsystem
(4) Video Display subsystem
(5) Computer subsystem
(6) Servo subsystem

When these subsystems are interconnected, the VATTS provides accurate position and location of a cooperative target to within 1 meter.

VATTS is completely mobile and can be utilized on any terrain, during day or night operations.

The purpose of VATTS is to collect and time-synchronize data such that a target's position and velocity are correlated in time with a selected parameter or measurement of a discrete event such as a trigger pull. Once the data have been collected, the user may examine or extract data for later data reduction and analysis.

The overall operational flow and procedures are described in detail below. The VATTS system employment decisions are made by the operator and communicated to the system via the CRT keyboard. For each entry, there is a specific response. Figure I-1 illustrates the overall VATTS operational flow.

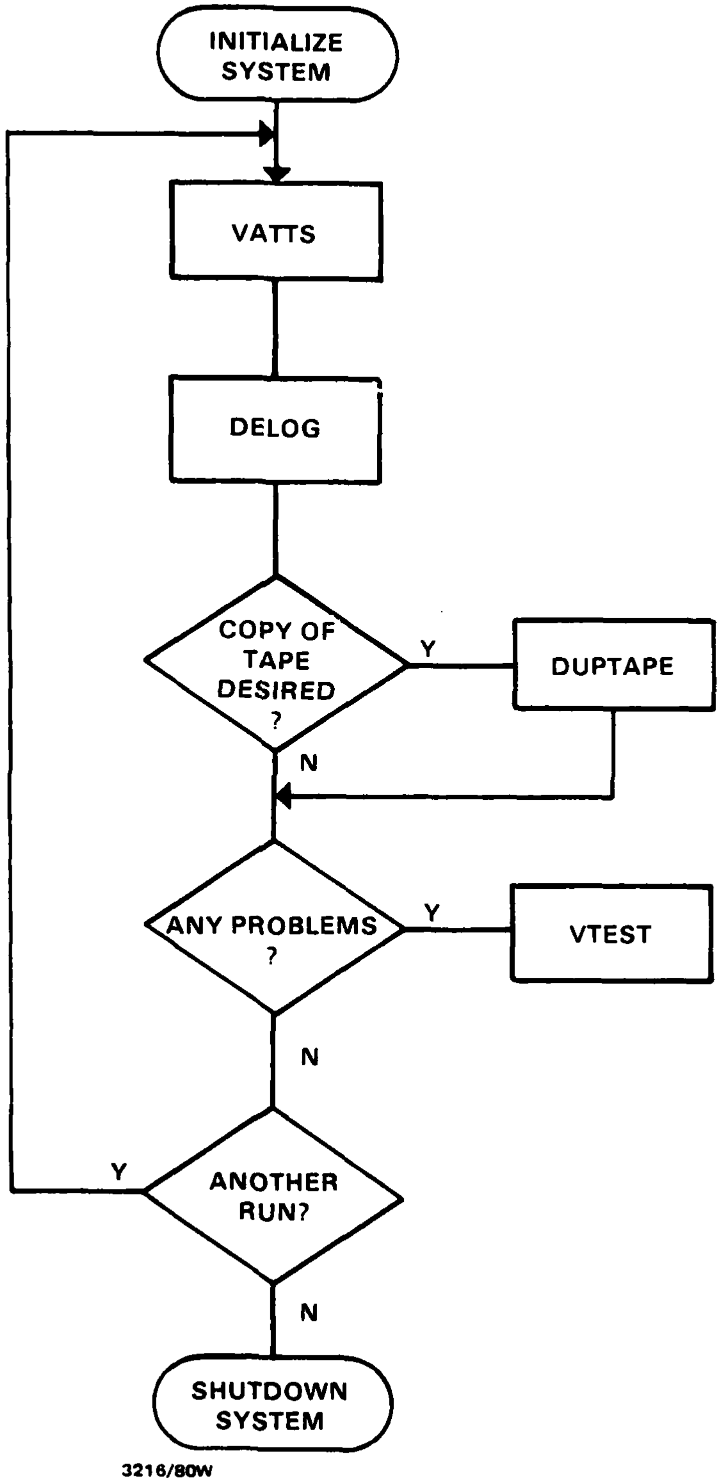

Figure I-1. VATTS Operational Flow

B. ACRONYMS AND ABBREVIATIONS

The acronyms and abbreviations used in this technical manual, such as Video Automatic Target Tracking Systems (VATTS), are as follows. This section covers many, but not all, of the acronyms and abbreviations used in the manual. Those not defined here may be found in each individual system's manuals, since they tend to be system specific.

VATTS	Video Automatic Target Tracking System
IR	Infrared light
RRPL	Range Recording Position Location
I/O	Input/Output
WFV	Wide Field of View Camera
NFV	Narrow Field of View Camera
LRF	Laser Range Finder
SYNC	Synchronized/In synchronization
INT	Internal
EXT	External
PWR	Power
Kw	Kilowatt
KGM/CM^2	Kilogram per square centimeter
PSI	Pressure in lbs per square inch
INTGEN	Internal Generator
Hz	Hertz (Frequency)
VAC	Volts AC
AZ	Azimuth
EL	Elevation
MAG1	Magnetic Tape Transport Number One
MAG2	Magnetic Tape Transport Number Two
TK1	Tektronics I/O Terminal
DS1	Removable Disk Storage Unit
DSØ	Fixed Disk Storage Unit
CRT	Cathode Ray Tube

RIU	Range Interface Unit
PASLA	Programmable Asynchronous Single Line Adapter
LSU	Loader Storage Unit
CPU	Central Processing Unit
VTR	Video Tape Recorder
SYS	System
OS/32ST	Interdata Operating Software System
PROT	Protect
CR	Carriage Return
DELOG	Delogs Information recorded on MAGTAPE
EDIT	Edits programs listed on disk
VTEST	Test Program for VATTS
BIAS	Mathmatically zeros azimuth and elevation information
A/D	Analog to Digital Information Transform
D/A	Digital to Analog Information Transform
DAC	Digital to Analog Connector
MOBSTAB	Mobile Stabilization
EOF	End of File (Mark on Mag Tape)
BOF	Beginning of File (Mark on Mag Tape)
BFILE	Back file (moves Mag tape backwards)
FFILE	Forward file (moves Mag Tape Forward)
WFILE	Writes on extra file (mark on Mag Tape)
AZEL	Quick look at Trial Information Program
DUPTAPE	Allows for duplication of magnetic tapes
CA	Cancel (terminates program on-line)
T	Terminate (terminates program on-line)
EN	End (terminates program on-line)
BRK	Break (interrupts program on-line)

SECTION II

SET UP PROCEDURES AND FORMS

SECTION II
SET UP PROCEDURES AND FORMS

A. INTRODUCTION

This section deals with the site selection, field installation, power hook ups, pedestal, survey, and forms.

The selection of the location of the VATTS van in relationship to the target vehicle path of travel is very important. One must take into consideration vehicle introduced obscurations, such as dust or, smoke, any objects that will obscure video lock-on, and changes in target velocity in respect to selected pedestal location.

Power hook up can be achieved either by use of existing commercial power, or by use of the internal system power generator.

Survey of calibration points, when possible, should be accomplished by a trained survey team. This is to be done to eliminate any errors in survey calculations.

The forms that are supplied for use in the pretrial, trial, and post trial procedures are to be filled out completely as specified.

B. Site Selection

The VATTS system utilizes an IR beacon and a laser system for position location. These are both line-of-sight (LOS) systems. For that reason it becomes necessary that the VATTS pedestal be located in such a position that line-of-sight is maintained to the target vehicle and calibration points at all times. The maximum range is limited by the beacon to about 2½ km.

The van must be located within 200' of the video pedestal due to limitations on the cable lengths. For similar reasons, the generator must be located within 100 feet of the van.

In the event that the Motorola RRPL is utilized in conjunction with VATTS, the two vans must be located close together for convenient cabling.

C. Field Installation

1. Trailer Setup

a. Locate the trailer up to 200' from the concrete pedestal, depending on the test area characteristics.

b. Level the trailer, utilizing the four screw leveling jacks.

c. Remove the camera pedestal assembly and mount it on a solid (concrete) pedestal (using a crane and the pedestal harness).

d. Remove all tapes used to secure the disc and the magnetic tape units.

e. Remove the disc head securing clamp.

f. Place all manuals on the top of the equipment racks.

2. Hookup Requirements (VATTS I/O Panel to the Pedestal)

a. Connect the camera #1 (WFV) video cable (200 feet - W18) from the VATTS I/O panel (J12) to the camera mount (J10).

b. Connect the camera #2 (NFV) video cable (200 feet - W19) from the VATTS I/O panel (J13) to the camera mount (J9).

c. Connect the camera power cable (200 feet - W15) from the VATTS I/O panel (J1) to the camera mount (J5).

d. Connect the servo power cable (200 feet - W3) from the VATTS I/O panel (J3) to the camera mount (J3).

e. Connect the data cable (200 feet - W5) from the VATTS I/O panel (J10) to the camera mount (J2).

f. Connect the data cable (200 feet - W2) from the VATTS I/O panel (J11) to the camera mount (J1).

g. Connect the camera #1 zoom control cable (200 feet - W5) from the VATTS I/O panel (J2) to the camera mount (J4).

h. Connect the camera mount ground cable (200 feet) to the VATTS system I/O panel ground.

i. Connect LRF cable (4) to VATTS I/O panel.

3. Hookup Requirements (From the VATTS Generator to the VATTS System).

a. Connect the generator ground cable to a system ground stake.

b. Connect a ground cable from the ground stake to the ground junction located on the VATTS I/O panel (100 feet).

c. Connect the generator sync-lock cable (100 feet) to the VATTS sync-lock connector.

d. Connect the generator power cable to the VATTS Int/Ext generator disconnect box (Int. side), (100 feet).

D. POWER

1. VATTS generator power is supplied by a 30 kw generator which is part of the VATTS system.
2. Commercial power can be used. It must be 230 VAC center tapped to ground, such that two 115 VAC phases are supplied to the trailer.
3. If three-phase 205 VAC power is available, only two phases are used along with a return. (See Figure II-1 and Figure II-2.)

E. Pedestal

1. The Pedestal is mounted on a cement slab or other firm surface by way of a leveling plate. The leveling plate is attached to the concrete slab with 6 bolts embedded in the concrete. The pedestal is then mounted to the leveling pad by using 12 nuts, 6 nuts on the bottom of the leveling plate and 6 nuts on top. Leveling is performed by using 3 of the nuts embedded in concrete and adjusting until the bubble level is centered. Then all 6 nuts are tightened making sure that the level does not change.

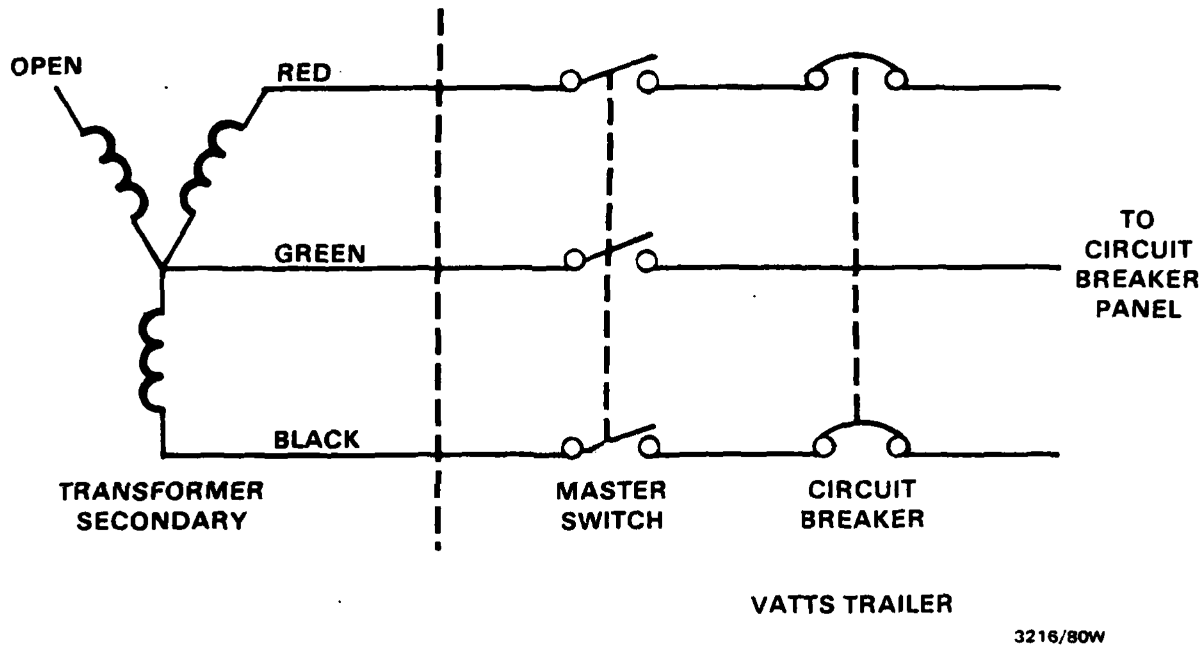

Figure II-1. Commercial Power

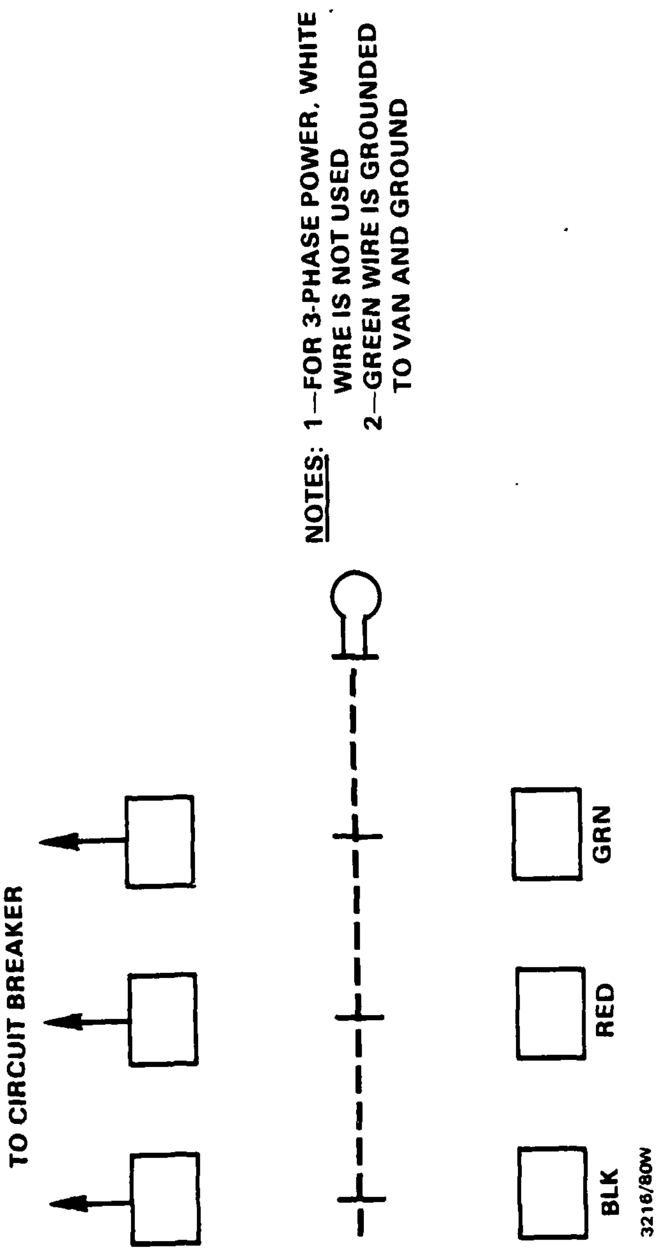

Figure II-2. External Generator Hook-up

F. SURVEY

1. Calibration Sites

A number of calibration sites should be selected. These sites should as nearly as possible encompass the azimuth, elevation, and range that will be utilized in testing. This may not always be possible, particularly in range.

The calibration sites as well as all stationary targets are then surveyed to the pedestal such that azimuth, elevation, and range to all surveyed points can be calculated. Translation of these data should be calculated to the front surface of the LRF for range and to the center of rotation of the pedestal for azimuth and elevation.

A plot of errors in elevation will then be made to compensate for these errors caused by inaccuracies in leveling the pedestal.

2. Survey Calculations (See Figure II-3 below)

a. Obtain survey data from all required points to a pedestal reference point (N). Data should include horizontal range, vertical height, and azimuth angle.

b. Draw a plan view of the pedestal area with lines representing each azimuth from R. Select one line as a reference and calculate angle from that survey out line to each other line.

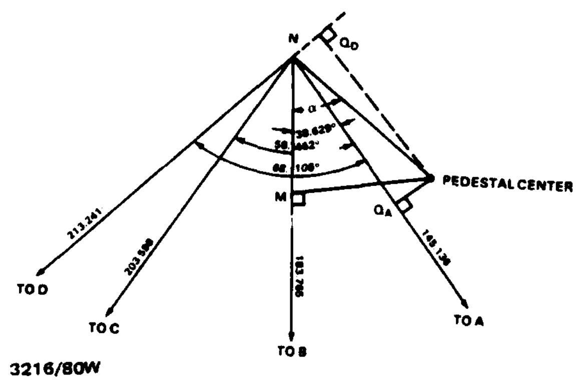

Figure II-3. Example Plan View

c. Along a known azimuth (N to B in example) determine a point perpendicular to a line to the center of the pedestal (M). Calculate the angle α (LMNP)

$$\alpha = \tan^{-1} \frac{MP}{NM}$$

and the line NP

$$NP = \frac{MP}{\mathrm{Sin}\alpha}$$

d. To each of the other lines radiating from N, calculate the ΔR and PQ

$$\Delta R_A = NP\ \mathrm{Cos}\ (\alpha \equiv 38.624) \text{ in example}$$
$$PQ_A = NP\ \mathrm{Sin}\ (\alpha \equiv 38.624)$$
$$\Delta R_B = NP\ \mathrm{Cas}\ \alpha$$
$$PQ_B = NP\ \mathrm{Sin}\ \alpha$$
$$\Delta R_C = NP\ \mathrm{Cos}\ (58.462 + \alpha \equiv 38.624)$$
$$PQ_C = NP\ \mathrm{sin}\ (58.462 + \alpha \equiv 38.624)$$
$$\Delta R_D = NP\ \mathrm{Cos}\ (68.105 + \alpha \equiv 38.624)$$
$$PQ_D = NP\ \mathrm{Sin}\ (68.105 + \alpha \equiv 38.624)$$

NOTE: ΔRd is negative in example.

e. Adjust range for pedestal location (.216 meters from pedestal center to front of LRF).

$$R_A = Rsa - \Delta Ra - 0.216 \quad (R_{SA} \text{ is surveyed})$$
$$R_B = Rsb - \Delta Ra - 0.216 \quad (R_{SB} \text{ is surveyed})$$
$$R_C = Rsc - \Delta Ra - 0.216 \quad (R_{SC} \text{ is surveyed})$$
$$R_D = Rsd - \Delta Ra - 0.216 \quad (R_{SD} \text{ is surveyed})$$

f. Adjust azimuth angle by adding $\Delta\emptyset$ where:

$$\Delta\emptyset_A = \tan^{-1} \frac{PQ_A}{R_A}$$

$$\Delta\emptyset_B = \tan^{-1} \frac{PQ_B}{R_B}$$

$$\Delta\emptyset_C = \tan^{-1} \frac{PQ_C}{R_C}$$

$$\Delta\emptyset_D = \tan^{-1} \frac{PQ_D}{R_D}$$

g. Measure the height of the narrow field of view camera (center of lens) above the surveyed reference point (N). Add this to the elevation of N. This is elevation zero. In like manner measure the calibration beacons above their surveyed point and add this to the surveyed elevation. The difference (usually negative) between the elevation of the calibration beacons and the camera elevation is the ΔE.

Example: $\Delta E_A = E_S + E_L - E_N - E_{CAM}$

where:

E_S is calibration survey elevation

E_L is height of light above Es

E_N is elevation of N

E_{CAM} is height of camera above N

h. To calculate the elevation angles to the VATTS head

$$\theta_A = \tan^{-1} \frac{\Delta E_A}{R_A}$$

$$\theta_B = \tan^{-1} \frac{\Delta E_B}{R_B}$$

$$\theta_C = \tan^{-1} \frac{\Delta E_C}{R_C}$$

$$\theta_D = \tan^{-1} \frac{\Delta E_D}{R_D}$$

i. Since perfect leveling cannot be achieved on the pedestal, the elevation bias should be set such that at one of the calibration points, the angle θ is as calculated. The other points are then measured with the system and measured is plotted so that corrections can be made by data processing.

G. FORMS

Two forms are used in the operation of the VATTS:

1. Daily Calibration Form
   a. This form is used to record daily azimuth, elevation and range values for each of the 4 calibration points.
   b. The differences between the calculated values and the measured values are due to survey error, VATTS error, noise, and the accuracy that the pedestal has been leveled.
   c. Figure II-4 provides an example of the Daily Calibration Forms.
2. VATTS Data Log

The log is used to record trial information so that data can subsequently be reduced from the Mag and Video tapes. Figure II-5 is an example of the Data Log.

	POINT 0			POINT A			POINT B			POINT C		
DATE	AZ	EL	R	AZ	EL	R	AZ	EL	R	AZ	EL	R
CALC												

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Figure II-4. Daily Calibration

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TEST OPERATIONS RECORD	PROJECT NO. 9-OTN 596	NOMENCLATURE: VATTS POSITION LOCATION SYSTEM DATA LOG	SUBTEST:	DATE:
			SITE:	OPERATOR:

SERIAL NUMBERS					
VIDEO TAPES		DIGITAL TAPES		PRINTOUTS	

DRIFT TEST	START			END		
	MIN	MEAN	MAX	MIN	MEAN	MAX
AZ						
EL						
R						

TRIAL			FILE HEADER		COUNTER VIDEO			START TIME			STOP TIME			REMARKS
			COURSE	SPEED										

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Figure II-5. VATTS Data Log

SECTION III

PROCEDURES FOR VIDEO AUTOMATIC TARGET TRACKING SYSTEMS (VATTS)

SECTION III
PROCEDURES FOR VIDEO AUTOMATIC TARGET TRACKING SYSTEM (VATTS)

A. INTRODUCTION

Procedures to be utilized in operating the VATTS van are detailed in this section. They are divided into three parts, consisting of Pretrial, Trial, and Post Trial Procedures. These procedures are meant to simplify the use of the VATTS.

Pretrial procedures consist of power-up of the internal system generator (if used) pedestal preparation, internal system power-up, and computer power-up. The initial header information is placed on the magnetic tape as a pretrial step since it is necessary to ensure that the data reduction personnel can easily catalog and file the tape according to the proper trials. This header is placed at the beginning of each digital tape. Also calibration is performed bi-daily to ensure reliability of the VATTS in data collection. And for added insurance, a drift check is performed prior to the first trial of the day.

Trial procedures are divided into five (5) simple parts, which are: (1) the acquisition of the VATTS program; (2) video lock-on of the target vehicle; (3) recording of the target vehicle on both video and magnetic tape; (4) ending this recording at the end of each test run; (5) and performing a quick look at the data collected by using the AZEL program. When the AZEL program is being utilized hard copies are made to ensure that the data is actually being recorded properly. When the above functions have been performed and are known to be reliable, the operator places double file marks at the end of the magnetic tape. This double file mark lets the data reduction personnel know that there is no more test information on that magnetic tape.

Post Trial procedures are divided into three major catagories; (1) duplication of the test tape; (2) data handling; and (3) complete system power-down. Also, duplication of the test tape is performed to

ensure a standby tape in the event the master magnetic tape is damaged or lost. Data handling is done by the operator. When the test is complete the operator turns over the magnetic tape, video tape, and all hand written forms to the data collection officer. After all test results are turned in, the operator then utilizes the power-down procedures to ensure all electronic data gathering equipment is properly secured for the day.

B. PRETRIAL PROCEDURES

1. Turn On

a. VATTS Internal Generator - Power Up

STEP 1 Check oil in engine.

STEP 2 Check water in engine and battery.

STEP 3 Check fuel tank gauges.

STEP 4 Check to see that INT/EXT DISCONNECT BOX is set to INT GEN position.

STEP 5 To insure that generator does not come up under load:

(a) Be sure switch on right side of thermostat is in OFF position (air conditioner).

(b) Main switch in breaker box (on back wall inside) is OFF. (Down)

(c) EXITER switch on engine panel (on back wall) to OFF position.

STEP 6 Move STOP/RUN swtich to RUN position, engine will start.

(a) Verify that engine oil pressure is 45 PSI/350 KGM/CM^2.

(b) Verify that engine temperature gauge reads at least 140°F.

STEP 7 Refer to internal power systems power-up.

b. VATTS External Generator - Power Up

STEP 1 Shut off all equipment and main breaker in VATTS trailer.

STEP 2 Verify that external power is at 208 volts @ 59.6 Hz.

STEP 3 Switch the INTERNAL/EXTERNAL DISCONNECT BOX to EXTERNAL.

STEP 4 Refer to INTERNAL SYSTEMS POWER-UP.

c. Pedestal

STEP 1 Remove cover from pedestal.

STEP 2 Remove azimuth lock.

STEP 3 Remove elevation lock.

STEP 4 Turn Operating Switch on.

d. Internal Systems Power Up

STEP 1 Switch main breaker box to ON position.

STEP 2 Turn on two (2) Sorenson power supplies and wait approximately four (4) seconds for warm-up. Adjust, if necessary, to 118 volts on meters.

STEP 3 Turn on air conditioner, character generator, pedestal power, time code generator, TV tracker, range interface unit (RIU), tracker TV monitors, camera control power, tektronix monitor, and hard-copy unit.

STEP 4 Refer to computer system start-up if computer is required.

STEP 5 Insure that time code generator is synchronized with master time code generator.

STEP 6 Place a new numbered tape on Mag 1 & turn on power.

STEP 7 Install video cassettes in VTR, rewind to start point and set counter.

e. Computer System Power Up

STEP 1 Ensure that CPU is turned off at hexidecimal display panel.

STEP 2 Disk subsystem start up.

(a) Make sure removal disk is loaded in drive and load switch is in load position.

(b) Apply power to disk by the power switch on disk front panel. If the power switch does not illuminate, check the back bay to see if disk is plugged in. If disk still does not come up, refer to disk maintenance manual.

(c) Load light shall come on, and a audible click will be heard after power is applied. This is normal.

(d) Switch RUN/LOAD to the run position. This switch will not illuminate.

(e) Ready light will come on after disk has come up to speed. If after several seconds ready light does not come on, push RUN/LOAD switch to load and retry disk startup.

(f) Now unprotect fixed platter of disk by switching PROT/FIXD switch to down (fixed) position. If PROT/FIXD switch does not go out, the disk is still warming up.

STEP 3 Loader storage unit startup: Turn loader storage unit LSU ON/OFF switch to on to energize LSU.

STEP 4 Turn key on hexadecimal display panel to on.

STEP 5 The following message shall appear on the video terminal *OS/32ST, after initialization switch is toggled.

*If message does not appear, check the following:

(a) Is disk ready light on? If not, retry disk subsystem startup.

(b) Is LSU on? If not, retry LSU subsystem startup.

STEP 6 Put LSU power switch in OFF position.

STEP 7 Computer system startup is now complete and programs can be run.

2. Initial Header File

STEP 1 Enter VATTS, (CR) on TK1.

STEP 2 Press (CR) 3 times.

STEP 3 Enter H, (CR).

STEP 4 Press (CR).

STEP 5 Enter subtest and date, (CR).
Example: MOBSTAB 27 Jun 80, (CR).

STEP 6 Enter Q observing tape motion for EOF.

STEP 7 Press (CR).

STEP 8 Enter T, (CR) to terminate VATTS (no EOF from T unless data is recorded).

3. Calibration

STEP 1 Enter VATTS, (CR) on TK1.

STEP 2 Enter CALIBRATION, (CR) on TK1.

STEP 3 Enter azimuth bias, (CR) on TK1.

STEP 4 Enter elevation bias, (CR) on TK1 and observe information on monitor that VATTS is operating.

STEP 5 Enter H, (CR) on TK1.

STEP 6 Enter 901 on TK1.

STEP 7 Set thumbwheel switch to 101 on control console for trail 101.

STEP 8 Enter CAL 0, (CR) on TK1.

STEP 9 With a vehicle go to calibration point 0 and apply power to the lamp.

STEP 10 Turn on LRF and observe that ranging is taking place.

STEP 11 Start tapes by pressing black and red button on joystick. Record start time, on VATTS data log, and AZ, EL, and Range, on Daily Calibration Form.

STEP 12 After 20 seconds stop tape by pressing black button on joystick. Stop VTR by pressing STOP and record counter information. Record on data log stop time.

STEP 13 Turn off laser.

STEP 14 Turn off lamp.

STEP 15 Enter Q, on TK1 observing on the magtape unit, that the tape moves indicating "EOF" has been made on the tape.

STEP 16 Move to Point A and repeat Steps 5 thru 15 with trial 102 and Header CAL A. Thumbwheel at 102.

STEP 17 Repeat for Point B with Trial 103 and CAL B header. Thumbwheel at 103.

STEP 18 Repeat for Point C Steps 5 thru 14 with Trial 104 and Cal C header. Thumbwheel at 104. Do not enter "Q".

STEP 19 Terminate "VATTS" with T (CR) on TK1 and observe that file mark has been made.

4. Drift Check

STEP 1 Enter VATTS, (CR) on TK1.

STEP 2 Enter DRIFT TEST and date, (CR) on TK1.

STEP 3 Enter azimuth bias, (CR) on TK1.

STEP 4 Enter elevation bias (CR) on TK1. Observe on monitor that VATTS is operating.

STEP 5 Enter 10.5, (CR) on TK1. Set thumbwheel switch to 105.

STEP 6 Enter DRIFT, (CR) on TK1.

STEP 7 With vehicle stationary and beacon on, lock on the beacon and turn on LRF and record minimum, maximum, and most consistent readings of azimuth elevation and range.

STEP 8 Start tape by pressing black (mag tape) and red (video) buttons on joystick. (RECORD TIME.)

STEP 9 After 20 seconds, stop tapes by pressing black button on joystick. Record stop time. Stop the mag tape unit and stop VCR by pressing Stop. Terminate "VATTS" with T, (CR) on TK1.

B. <u>TRIAL PROCEDURES</u>

1. <u>VATTS Program Acquisition</u>

STEP 1 Enter VATTS, (CR) on TK1.

STEP 2 Enter File Header, (CR) on TK1.

STEP 3 Enter Azimuth Bias, (CR) on TK1.

STEP 4 Enter Elevation Bias, (CR) on TK1. Observe monitor to insure "VATTS" is operating.

STEP 5 Enter H, (CR) on TK1.

STEP 6 Enter Trial Number XXX, (CR) on TK1.

STEP 7 Enter Header, (CR) on TK1.

STEP 8 Record VTR Counter.

2. <u>Video Target Acquisition and Tracking</u>

STEP 1 Using the joystick, acquire and lock on the vehicle beacon.

STEP 2 Turn on the LRF and observe that range is being acquired.

STEP 3 At the countdown point of "3", start the magnetic and video tapes by pressing both the black and red buttons on the joystick.

STEP 4 Record start time.

STEP 5 Monitor system tracking and range return to insure system is functioning properly.

3. <u>End of Trial</u>

STEP 1 Turn off magnetic tape unit by pressing black button on joystick.

STEP 2 Turn off video tape by pressing stop on VTR.

STEP 3 Record stop time.

STEP 4 Terminate VATTS by entering T, (CR) on TK1.

4. <u>AZEL Program Acquisition</u>

a. <u>Backfile (BFILE)</u>

STEP 1 Enter BFILE MAG 1:, (CR) on TK1 (tape will move slightly).

STEP 2 Again enter BFILE MAG 1:, (CR) on TK1 (tape will back file to last EOF mark).

b. <u>Forward File (FFILE)</u>

STEP 1 If tape is not at "load," enter FFILE MAG 1:, (CR) on TK1 (tape will advance slightly).

STEP 2 NOTE: Read the above prior to signing on to use AZEL Program.

c. <u>AZEL Program File</u>

STEP 1 Enter AZEL, (CR) on TK1.

STEP 2 Press (CR) on TK1 (start time at beginning).

STEP 3 Press (CR) on TK1 (stop time at end).

STEP 4 Enter 20, (CR).

STEP 5 Press (CR) on TKI to start AZEL.

STEP 6 When page is full, hit copy on TK1.

STEP 7 Hit page and CR to display each page and copy to make hard copy. Repeat until end of file is reached.

STEP 8 "NOTE" See BACKFILE and FORWARD FILE procedure. If terminated before EOF is reached, it is necessary to enter FFILE MAG 1:, (CR). To advance tape FOR next trial.

STEP 9 Repeat Procedures 1 thru 7 for each trial on the tape.

5. <u>End of Daily Trials</u>

STEP 1 On last trial on the tape, terminate "VATTS" by entering Q on TK1 observing that the mag-tape moves.

STEP 2 Press (CR).

STEP 3 Enter T, (CR) and observe that the end of file is written on tape.

STEP 4 NOTE: An alternate end of tape can be accomplished by terminating the VATTS with T, (CR) and then enter WFILE MAG 1:, (CR).

C. POST TRIAL PROCEDURES

1. Duplicate Tape (DUPTAPE) Acquisition

STEP 1 Place new tape on Mag 2.

STEP 2 Rewind Mag 1.

STEP 3 Enter DUPTAPE on TK1.

STEP 4 Repeat entry of DUPTAPE on TK1 for each file.

2. Tapes and Forms Handling

STEP 1 Remove tapes from Mag 1 and Mag 2.

STEP 2 Remove video tape from VTR.

STEP 3 Along with form, hard copies turn over to data collection officer.

3. Computer System - Power Down

STEP 1 Type in on T1: RES CL, (CR) to close all files.

STEP 2 If disk 1 is marked on enter on TK1: MADS1:,OFF, (CR).

STEP 3 If disk ϕ is marked on ENTER On TK1: MADSØ:,OFF, (CR).

STEP 4 Disk subsystem shutdown:

(a) Protect both disk platters by placing protect switches in PROT position.

(b) Put run/load switch in load position and wait for load light to illuminate.

(c) Turn disk power off.

STEP 5 Mag Tape subsystem shutdown.

(a) Dismount any tapes mounted on drives.

STEP 6 Power down CPU by turning key on hexadecimal display panel to off position.

4. <u>Internal Systems - Power Down</u>

STEP 1 Turn off hard copy unit, tektronix monitor, camera control power, tracker TV monitors, ranger interface unit (RIU), TV tracker, time code generator, pedestal power, character generator and air conditioner.

STEP 2 Turn OFF two (2) Sorenson power supplies.

STEP 3 Switch main breaker in breaker box to OFF position.

5. <u>Internal Generator - Power Down</u>

STEP 1 On internal generator panel switch, exciter switch shall be turned to off position.

STEP 2 Move Run/Stop switch to OFF.

STEP 3 Generator will stop.

6. <u>Pedestal Securing</u>

STEP 1 Insert Azimuth lock.

STEP 2 Insert Elevation lock.

STEP 3 Turn Operate Switch OFF.

STEP 4 Place cover over the Pedestal.

SECTION IV

VATTS SYSTEM SOFTWARE AND OPERATIONS

SECTION IV
VATTS SYSTEM SOFTWARE AND OPERATIONS

A. INTRODUCTION

1. VATTS System Overview

The Video Automatic Target Tracking System (VATTS) is an integrated hardware/software system which collects position, analog and discrete data in real-time and records them for later data reduction and evaluation.

VATTS is composed of 6 major subsystems:

- Trailer subsystem
- Tracker subsystem
- Optical subsystem
- Video Display subsystem
- Computer subsystem
- Servo subsystem

These operating instructions address only the computer subsystem. The VATTS software contains the operating system (OS/32 ST) and 4 application software programs. The application programs provide the particular support required for this application. This section discusses the operation of the DBA supplied application software. The reader is assumed to have read the OS/32ST Program reference Manual.

2. Operational Overview

The purpose of VATTS is to acquire and time synchronize data such that a target's position and velocity are correlated in time with a selected parameter measurement of discrete event, i.e., a trigger pull. Once the data has been collected, the user may examine or extract data for later data reduction. The overall operational flow is illustrated in Figure IV-1. Each block in Figure IV-1 represents a major software task.

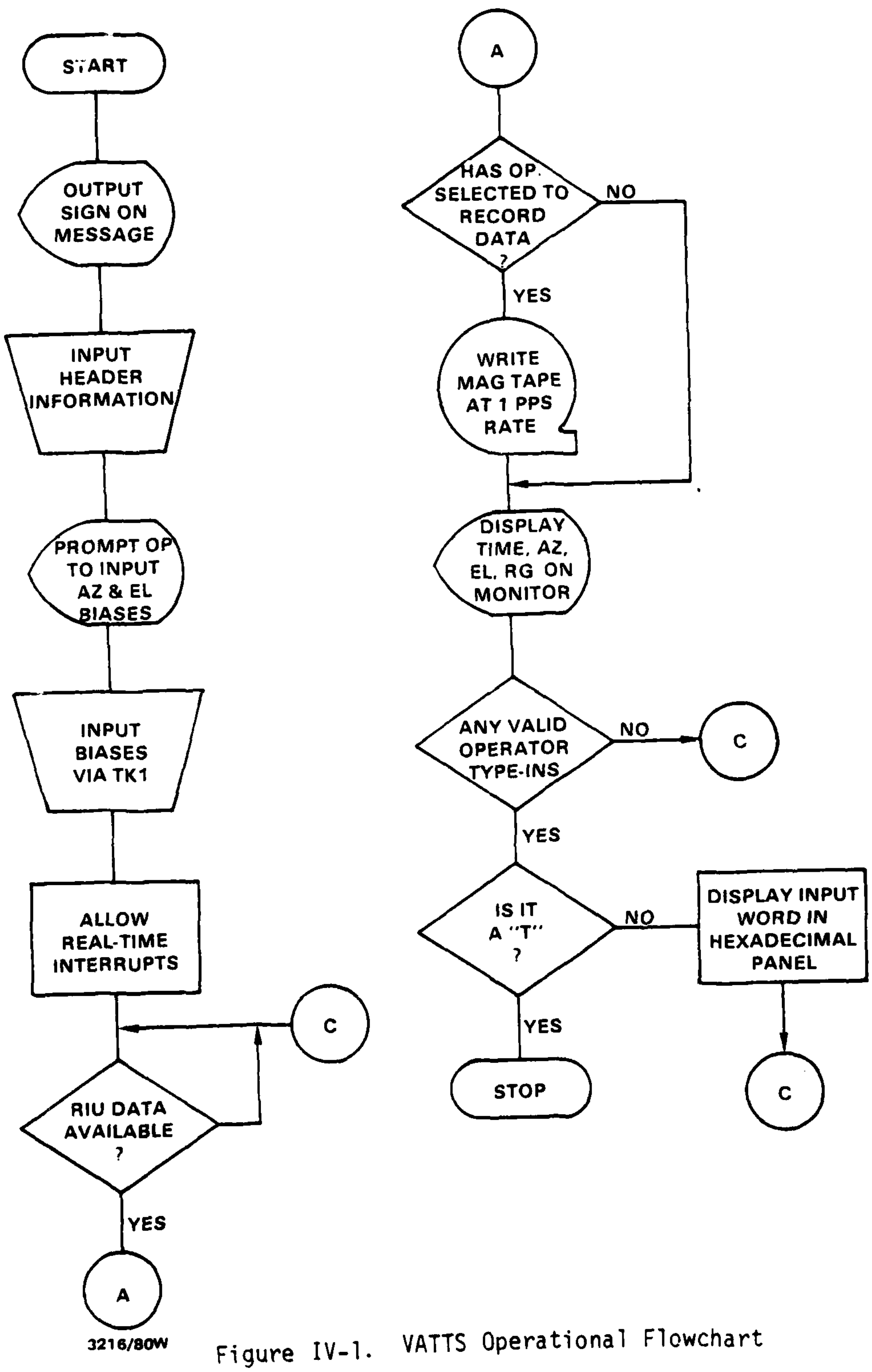


Figure IV-1. VATTS Operational Flowchart

The decisions are made by the operator and communicated to the system via the CRT keyboard. For each operator entry, there is a defined response.

VATTS software consists of (1) the INTERDATA 7/32 operating system (OS/32ST) and (2) the applications programs VATTS, VTEST, DELOG, AZEL, and DUPTAPE. The following paragraphs discuss and explain the application of the above programs.

B. OS/32ST SOFTWARE

The user controls OS/32ST via the CRT keyboard. The symbolic names of all physical I/O units are listed in Table IV-1. These names are fixed at system generation and have significance since they link a symbolic name with a physical I/O processor. Logical I/O units are numbered 1 thru 10. Any logical unit may be connected to any physical unit name, i.e., AS 1, TKI: <RETURN> which assigns logical unit 1 to the operator's CRT keyboard (TK1). The logical/physical unit concept allows the user total flexibility in peripheral unit assignment while leaving the assignment transparent to the user program.

The operating system, OS/32ST, is loaded by the Loader Storage Unit (LSU) from the disc. The OS initializes itself and outputs a message to TK1 with its name. It then outputs the prompt character, an asterisk, and waits for operating input via the keyboard. The user may now input any legal commands, and, if possible, OS/32ST executes those commands. When command processing is completed, the operating system prompts the user another asterisk. The reader is referred to the OS/32ST Program Reference Manual for all legitimate commands.

When the user executes any application program, the prompt character is changed to a J. If the user wants to input commands to the OS, he strikes BREAK key and inputs the command. The input is terminated by depressing the RETURN key. The user can talk to both the operating system and the application program with relative ease.

TABLE IV-1. PHYSICAL UNIT SYMBOLIC NAMES

SYMBOLIC NAME	PHYSICAL DEVICE ADDRESS (HEX)	TYPE OF DEVICE
NULL	Ø	DUMMY
TK1	10	PASLA-CRT INPUT OUTPUT
CEN	14	PASLA-MMR INPUT
CRT	16	PASLA-ATAADS INPUT
MAG1	85	MAG TAPE 1
MAG2	95	MAG TAPE 2
DS1	C633	REMOVAL DISC
DSØ	C732	FIXED DISC

C. VATTS SOFTWARE

The applications program prompts the operations with a fixed sequence of messages for any entry. These prompts consist of a message indicating the type of data, i.e., AZIMUTH BIAS, ELEVATION BIAS, and the format that the value should be input. Each of the prompting messages is documented with the program to which it applies.

The two real-time programs, VATTS and VTEST, also are capable of accepting keyboard inputs in real-time. There are no prompting messages for these inputs since they may be entered via the keyboard in any sequence.

The VATTS REAL-TIME program is documented in the following sections. The subroutines are only those of the VATTS Program. The subroutine map shows the highest level software on the left, and order of execution, with the exception of interrupt subroutines, is shown from top to bottom. This order is shown in Figure IV-2.

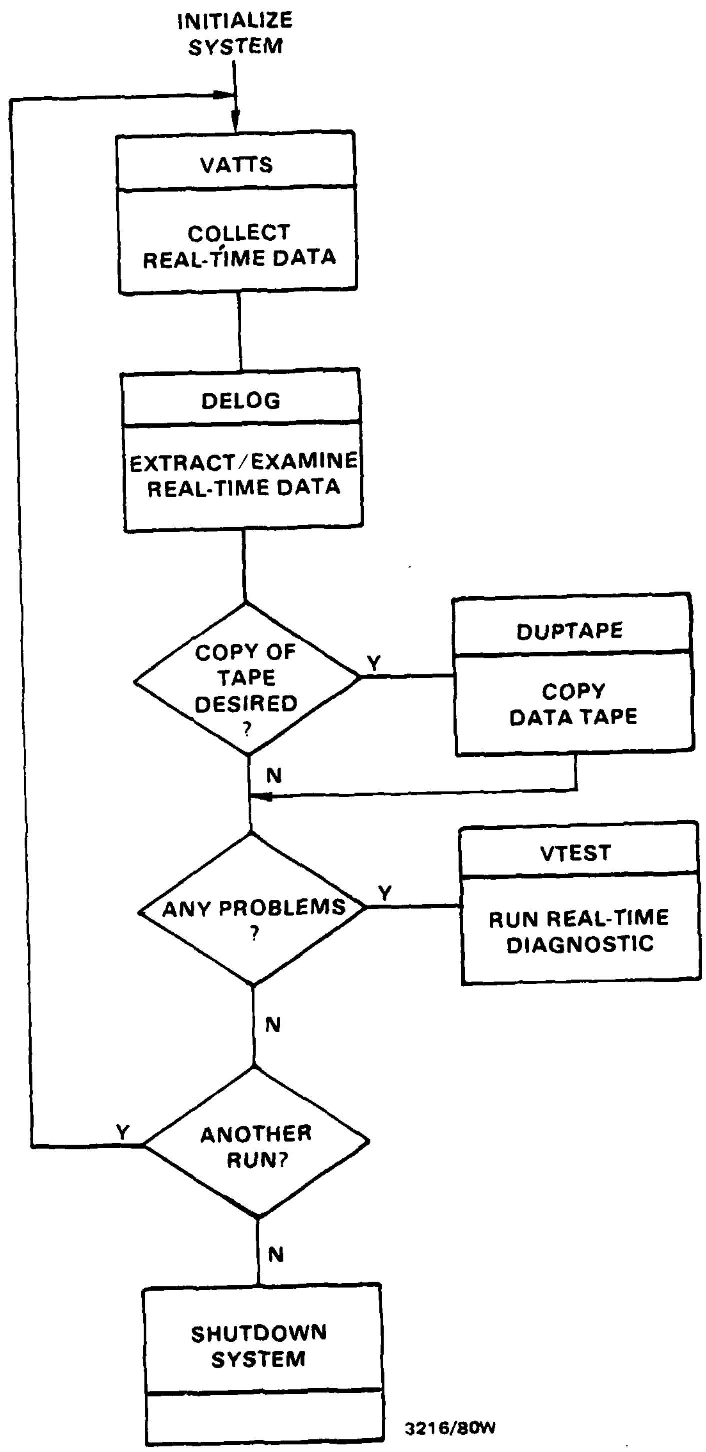


Figure IV-2. VATTS Software Loop

D. VATTS SOFTWARE APPLICATIONS

1. Overview

This section describes the function of each program and how the user controls the software to accomplish that function. The operator inputs and program reply are described.

2. VATTS Real-Time Software (VATTS)

VATTS is the real-time data collection program. Its primary purpose is to collect and record in digital form the required tracker data, analog and trigger pull information. The operational flow is illustrated in Figure IV-2.

3. VATTS Operational Description

Once VATTS is loaded, it signs on with the program identifier and prompts the operator with a message to input a header. This is to allow recording of the header on video tape prior to the data run. Next the operator is requested to input the AZIMUTH and ELEVATION BIAS. Each of these inputs is activated by depressing the RETURN key. The program now starts real-time data collection. The operator can record data on magnetic tape by depressing the leftmost button on the joystick. He terminates data recording by again depressing the same button. The operator may start and stop the tape any number of times during a single run.

When the operator wishes to terminate VATTS, he inputs the letter T RETURN. This single input terminates the program.

The program displays on the TV monitor the current real-time, the current azimuth and elevation with the biases added in. The program also displays selected raw input data in the Hexadecimal Display Panel as illustrated in Figure IV-3. The user selects the WORD number by depressing the key on TK1. The list of available inputs in Table IV-2. Each input is activated by depressing the RETURN key on TK1. The program displays the selected WORD NUMBER and the INPUT VALUE of that word number in real-time. The RIU INTERRUPT count is displayed to show the user that the VATTS program is receiving interrupts from the Range Interface Unit.

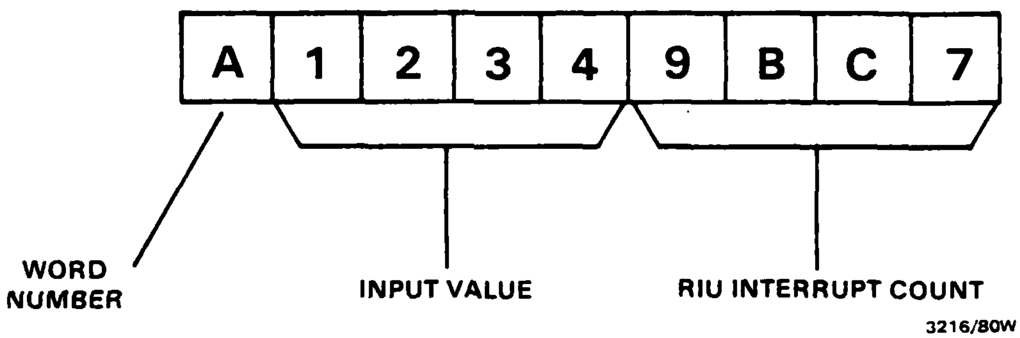


Figure IV-3. Hexadecimal Display Panel

TABLE IV-2. REAL TIME OPERATOR INPUTS

MNEMONIC	FUNCTION	COMMENT	
1	D*	RIU WORD	ALL DISPLAYS IN HEX.
2	D	RIU WORD	REFERENCE RIU INPUT
3	D	RIU WORD	DATA FORMAT
4	D	RIU WORD	
5	D	RIU WORD	
6	D	RIU WORD	
7	D	RIU WORD	
8	D	RIU WORD	
9	D	RIU WORD	
T	C*	TERMINATES VATTS PROGRAM	

NOTE: 1. D = DISPLAY DATA; C = CONTROL

4. VATTS Commands

The 64 character header annotation is input so the operator may record pertinent information on the video tape recorder. The input is displayed on the operator monitor in real-time.

EXAMPLE:

≥ THIS WILL BE DISPLAYED IN REAL-TIME. <RETURN>

The second input is the azimuth offset in degrees.

EXAMPLE:

≥ + 10.5 <RETURN>

Or

> 10.5 <RETURN>

Both of the above area the same.

The third input has the same format as the second but is the elevation bias.

EXAMPLE:

≥ - 179.9 <RETURN>

This inputs a minus 179.9 degrees.

≥ A + 174

The above input is wrong since it contains the letter A.

Both of the above inputs are treated the same way. The input value is <u>added</u> to the raw input. The sum is then displayed on the operator monitor and recorded on digital tape. The program now starts cycling in real-time. The prompt, >, is output on TK1: and each input is a single character input.

E. VATTS SUBPROGRAMS

1. VTEST Software

VTEST is the real-time software used to troubleshoot the RIU. The current RIU input data can be displayed on TK1 by depressing the <RETURN> key. The VTEST operationed flow is depicted in Figure IV-4.

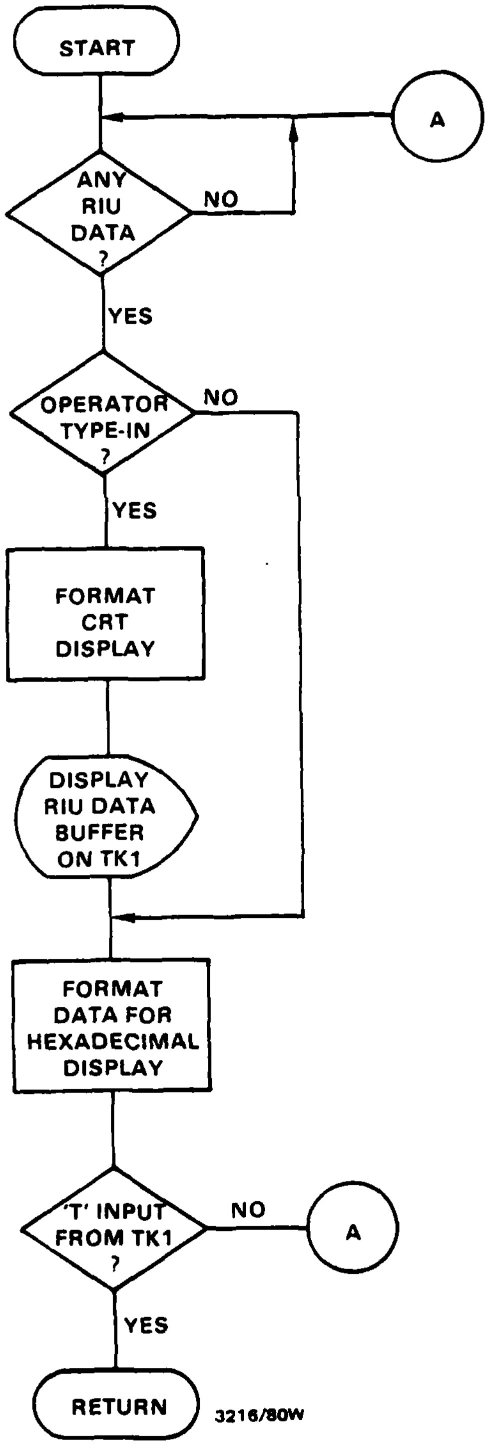


Figure IV-4. VTEST Operational Flowchart

2. VTEST Operational Description

When VTEST signs on, the program begins to cycle in real-time. The operator may display the current RIU input buffer by depressing the <RETURN> key. The first five words, counting from the left, are the RIU INPUT BUFFER. The last words are the Analog to Digital (A/D) words. The A/D word contains A/DØ and A/D1 words as input which may be displayed on the Hexadecimal Display Panel in the manner as illustrated in Figure IV-3. The operator may select any single word for display by typing the corresponding input on TK1. The allowable entries are listed in Table IV-2. The operator should verify that the entry was accepted by examining the word number window on the Hexadecimal Display Panel.

VTEST displays the current RIU buffer anytime the <RETURN> key is depressed on TK1. A sample output from VTEST is shown in Figure IV-5. The operator terminates VTEST by inputting a 'T <RETURN>'.

3. DELOG Software

The DELOG program furnishes the user with a quick look capability. Its purpose is to allow the user to examine a small amount of the data recorded during a selected time frame. The data tape is assigned to MAG1.

4. DELOG Operational Description

The operator furnishes the program with 3 inputs. These inputs, in order, are the START TIME, STOP TIME, and the frequency that the program is to display the data on TK1 for the user's viewing. The DEBUG entry is used to see the raw EBCDIC data. The user may specify a Ø start and stop time, which causes the program to scan the tape from its current position until a file mark is detected.

The START TIME is requested in the form of hours (H), minutes (M) and seconds.

EXAMPLE:

123000 <RETURN>

specifies a start time of 12 hours, 30 minutes and zero seconds. Notice that the input is terminated with a <RETURN>.

```
>
 CYCLE    215     BUFFER  1     RIU INPUT
  FØØØDDOC  284ØFFFF  FFDFFFFF  7E9AFC82   FFFF5ØØØ  4BØØ4CØ
>
 CYCLE    247     BUFFER  1     RIU INPUT
  FØØØDDØC  589ØFFFF  FFDFFFFF  7E9AFC82   FFFF5ØØØ  4CØØ4C8
>
 CYCLE    276     BUFFER  2     RIU INPUT
  FØØØDDØC  589ØFFFF  FFDFFFFF  7E9AFC82   FFFF5ØØØ  4BØØ4CØ
>
 CYCLE    303     BUFFER  2     RIU INPUT
  FØØØDDØC  724ØFFFF  FFDFFFFF  7E9AFC82   FFFF5ØØØ  4B8Ø4CØ
>
 CYCLE    331     BUFFER  1     RIU INPUT
  FØØØDDØC  864ØFFFF  FFDFFFFF  7E9AFC82   FFFF5ØØØ  4A8Ø4B8
```

Figure IV-5. VTEST SAMPLE OUTPUT

The STOP TIME input is of exactly the same format as the start time. The START TIME must be less than the STOP TIME. If no STOP TIME is input, the DELOG program continues displaying data until a file mark is detected.

The SAMPLE INTERVAL determines the rate at which data is displayed on TK1.

EXAMPLE:

ø <RETURN>

This displays every tape record. Table IV-3 shows the allowable type-ins and the frequency of sample display.

The Debug display is used only when the operator wishes to display the EBCDIC data from the tape. The usual answer is N <RETURN>.

Once all operator inputs have been supplied, the program starts looking for a START time if entered. Once the START time is found. DELOG displays data at the requested frequency until either the STOP TIME is found or a file mark is read. In either case, the DELOG then returns control to the operating system. DELOG operational flows are depicted in Figure IV-6.

5. <u>DUPTAPE Software</u>

DUPTAPE copies a data tape recorded by VATTS. The input tape is on MAG1, and the output tape is on MAG2. There are no operator entries. DUPTAPE copies the tape from its current position until a file mark is read. A file mark is then written on the output tape.

TABLE IV-3. DELOG OPERATOR INPUTS AND SAMPLE RATES

A. INPUTS

MNEMONIC	FUNCTION	COMMENT
1	D*	RIU WORD 1
2	D	RIU WORD 2
3	D	RIU WORD 3
4	D	RIU WORD 4
5	D	RIU WORD 5
6	D	RIU WORD 6
7	D	RIU WORD 7
8	D	RIU WORD 8
9	D	RIU WORD 9
A	D	A/D 2 10
B	D	A/D 1 11
T	C*	TERMINATES VTEST

NOTE: D = Display Data; C = Control Function

B. SAMPLE RATES

Sample Interval Input	Time Interval Between Data Display
20	1 SECOND
15	750 MILLISECONDS
10	500 MILLISECONDS
5	250 MILLISECONDS
Ø	50 MILLISECONDS

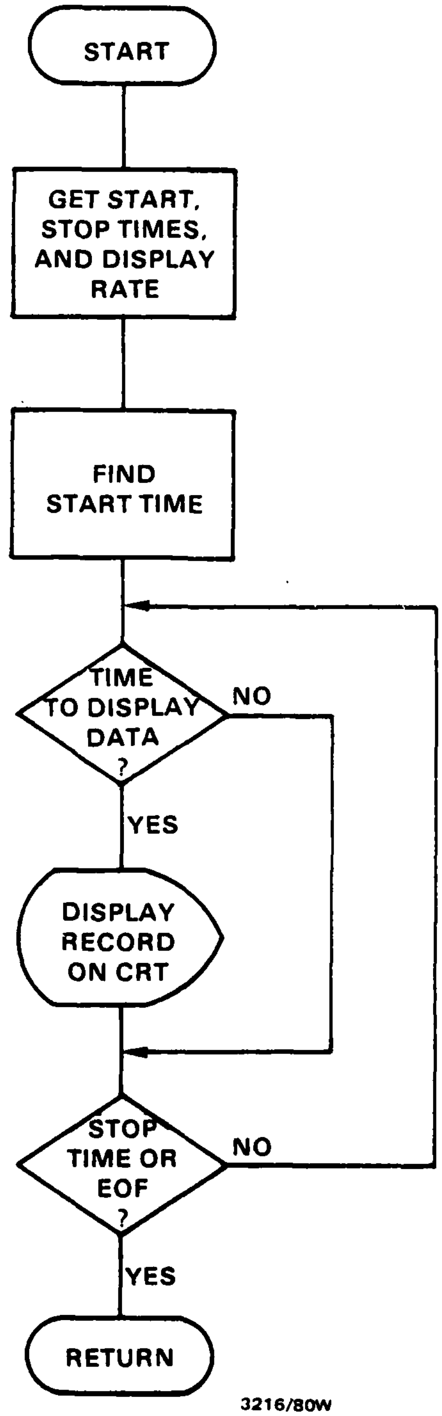


Figure IV-6. DELOG Operational Flowchart

SECTION V

INTERDATA SOFTWARE AND FLOW CHARTS

SECTION V
INTERDATA SOFTWARE AND
FLOW CHARTS

A. INTERDATA SOFTWARE

Interdata Software is supplied to the computer system in eleven (11) different programs. These programs enable VATTS system program to record, calculate, and output data. There are mnemonics in these programs and they must be located in the appropriate manuals, some mnemonics can only be found by training (formal) on the individual peripheral systems. These formatted programs are used mainly by the system programmer, and by maintenance technicians. Also included are the flow charts for each operation.

B. SOFTWARE DESCRIPTIONS

1. EXEC

a. Purpose:

This is the executive control program and ground loop. EXEC cycles once each 50 ms to decode all of the input and output the magnetic tape and CRT message.

b. Input:

RIU Input Buffer
A/D Input Buffer
MM Ranger Message
Trigger Pull List

c. Output:

Magnetic tape of formatted EBCDIC data at 1 pps and Time, Azimuth, Elevation and Range to the CRT at 5 pps.

d. Algorithm:

Flow chart of EXEC is provided in Figure V-1.

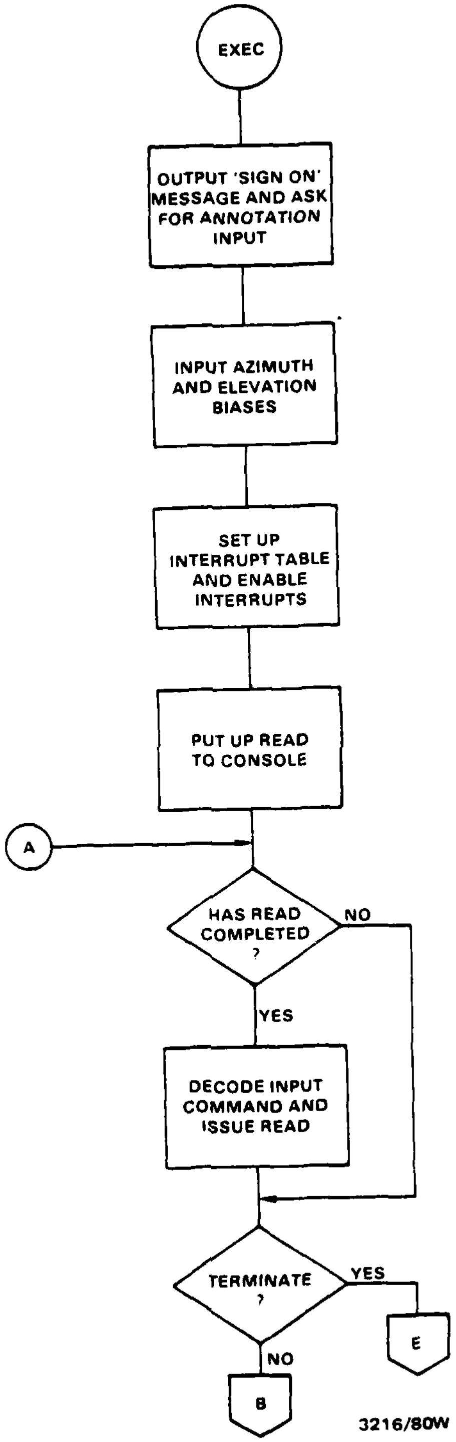


Figure V-1. EXEC Flowchart

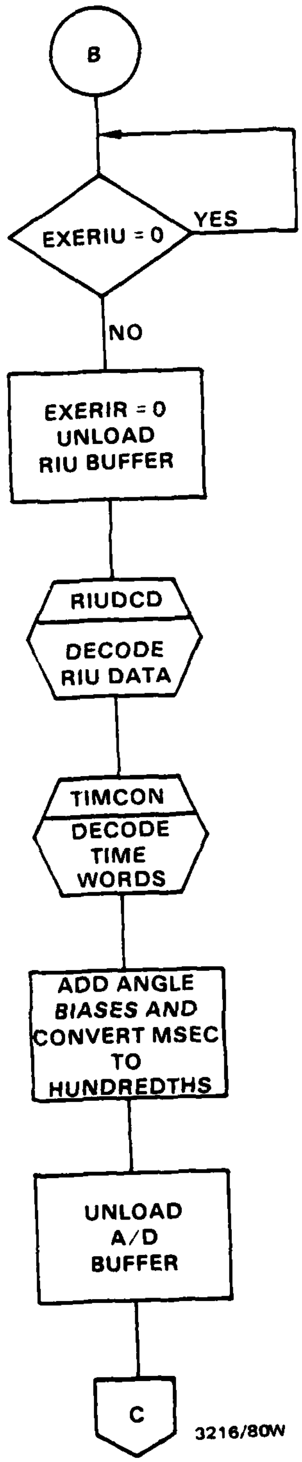


Figure V-1. EXEC Flowchart (Continued)

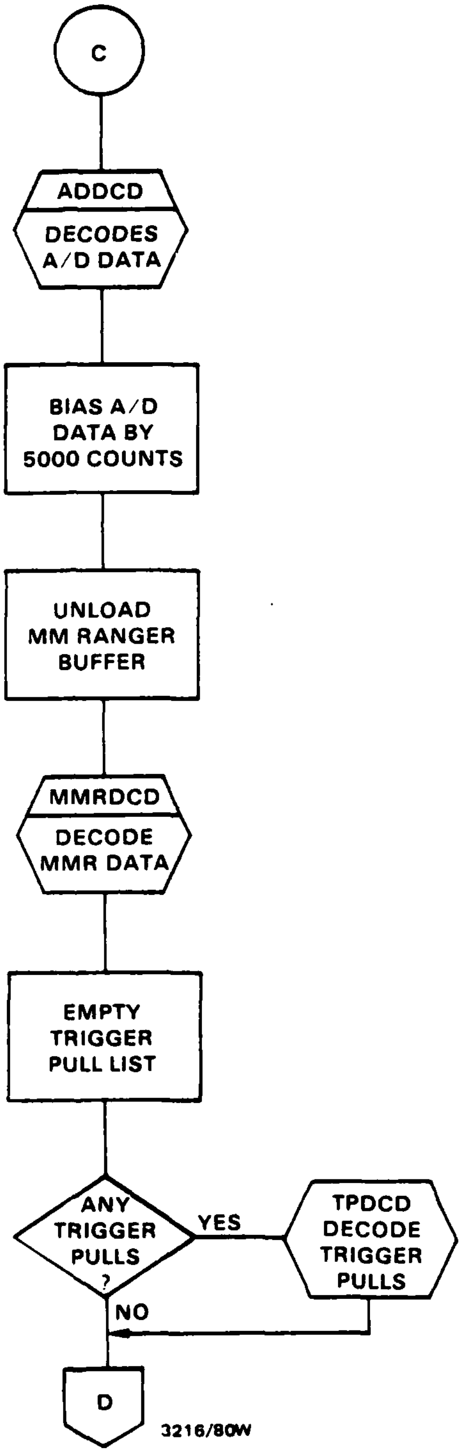


Figure V-1. EXEC Flowchart (Continued)

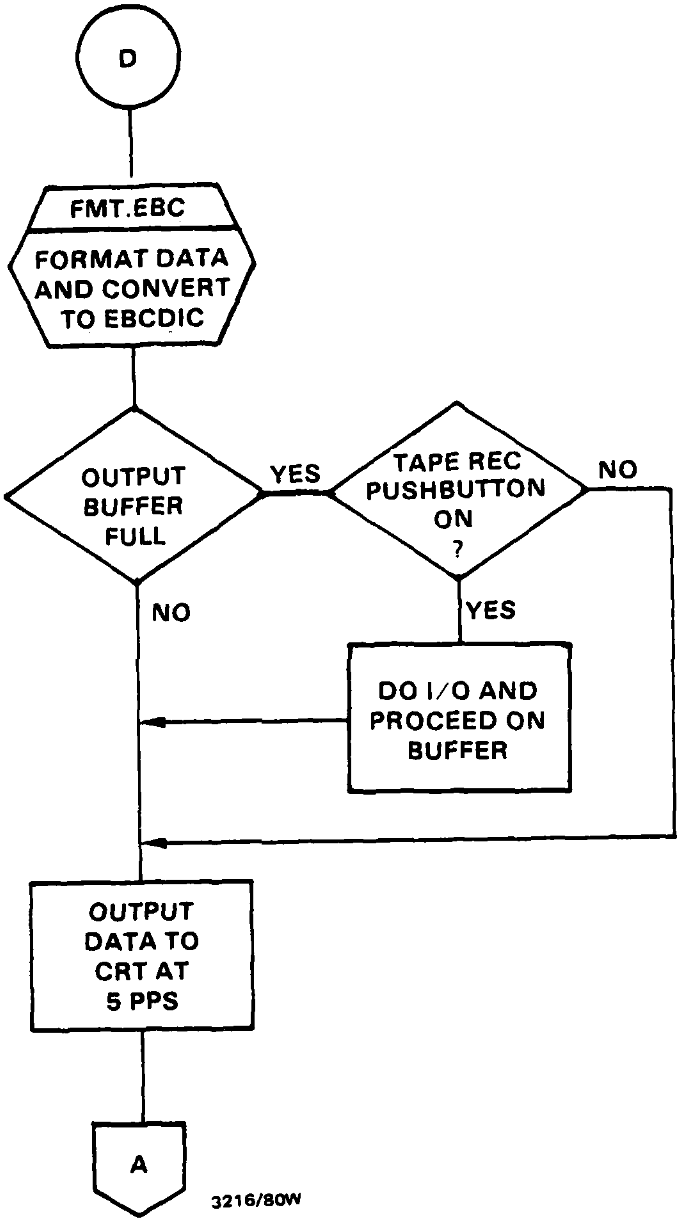


Figure V-1. EXEC Flowchart (Continued)

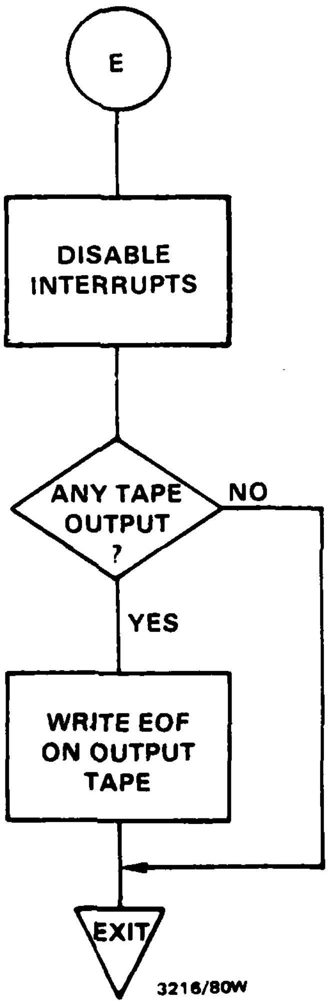


Figure V-1. EXEC Flowchart (Continued)

e. Calling Sequence:

N/A

f. Subroutines Used:

RIUDCD, ADDCD, TPDCD, MMRDCD, TIMCON, FMTEBC & SYSIO.

2. RIUISR

a. Purpose:

The purpose of this routine is to read the Range Interface Unit and the A/D converters based upon a 20 pps interrupt from the time code generator.

b. Input:

RIUIN - The pointer to the RIU input buffer: 1 = RIUBUF (1)
2 = RIUBUF (16)

RIU words 0-11
A/D words 0-5

c. Output:

RIUBUF (1)	=	Time Code Word 1
RIUBUF (2)	=	Time Code Word 2
RIUBUF (3)	=	Time Code Word 3
RIUBUF (4)	=	Azimuth Encoder
RIUBUF (5)	=	Elevation Encoder
RIUBUF (6)	=	Encoder MSB's
RIUBUF (7)	=	Tracker X
RIUBUF (8)	=	Tracker Y
RIUBUF (9)	=	Laser Range
RIUBUF (10)	=	Source Code and Discretes
ADIN (1)	=	A/D 0
ADIN (2)	=	A/D 1
ADIN (3)	=	A/D 2
ADIN (4)	=	A/D 3
ADIN (5)	=	A/D 4
ADIN (6)	=	A/D 5

d. Algorithm:

Flowchart for RIUISR is provided in Figure V-2.

e. Calling Sequence:

The address of this routine is placed in location y'110' and is vectored to upon an interrupt at device address y'20'.

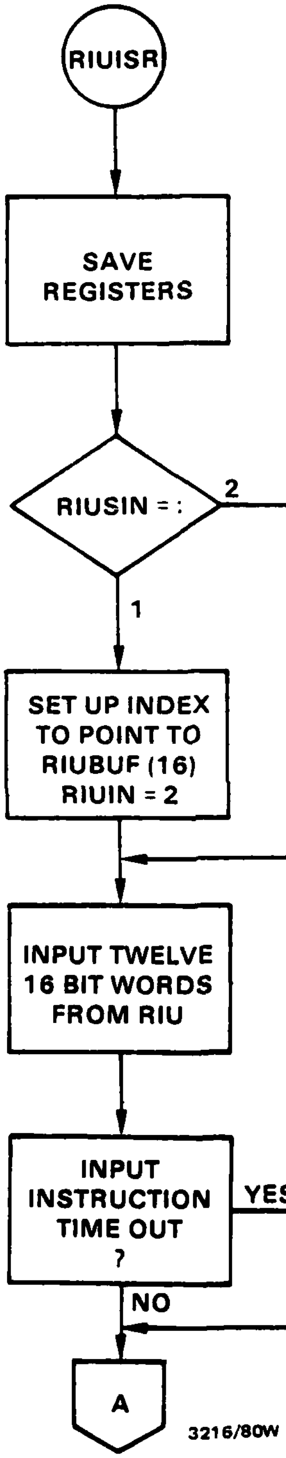


Figure V-2. RIUISR Flowchart

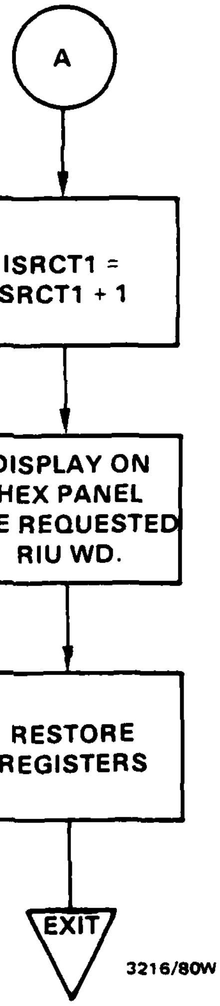


Figure V-2. RIUISR Flowchart (Continued)

f. Subroutines Used:

None

3. ADISR

a. Purpose:

This module inputs the A/D data. The actual code is contained in the RIUISR and is documented therein. No flowchart is available.

4. MMRISR

a. Purpose:

The purpose of this routine is to read the Motorola Mini Ranger data from the input modem.

b. Input:

Thirteen byte modem message consisting of two bytes of sync and eleven bytes of data.

c. Output:

The message is output in buffer MMRBUF. MMRIN points to the third of the buffer currently receiving data.

d. Algorithm:

Flowchart for MMRISR is provided in Figure V-3.

e. Calling Sequence:

This routine is vectored to upon an interrupt at device address y'8B'.

f. Subroutines Used:

None

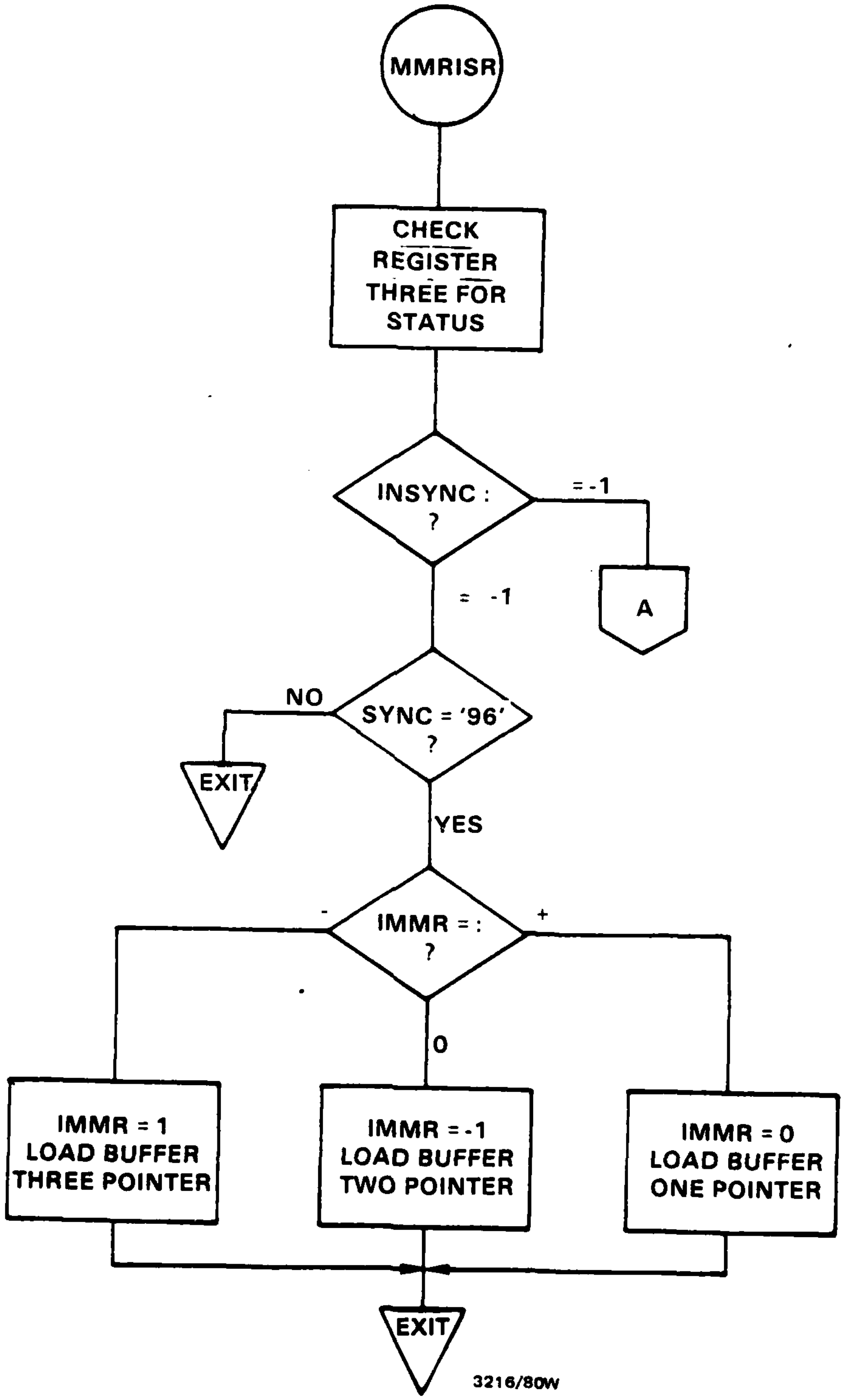


Figure V-3. MMRISR Flowchart

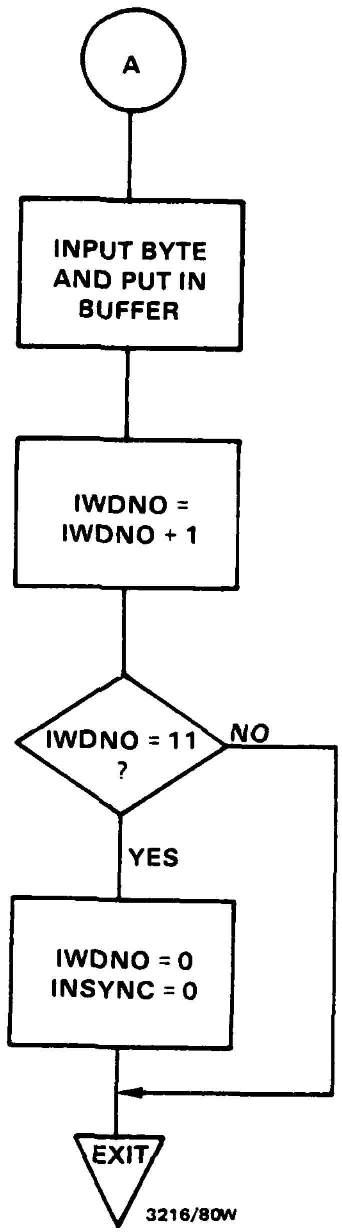


Figure V-3. MMRISR Flowchart (Continued)

5. TPISR

a. Purpose:

The purpose of this routine is to read the time code generator word three and the trigger pull word upon a trigger pull interrupt.

b. Input:

RIU word 3 (TCG Word 3)
Trigger Pull Word

c. Output:

The time code generator word three and the trigger pull word are added to the top the circular list ITPLST.

d. Algorithm:

Flowchart in Figure V-4.

e. Calling Sequence:

The address of this routine is placed in location y'112' and is vectored to upon an interrupt at device address y'21'.

f. Subroutines Used:

None

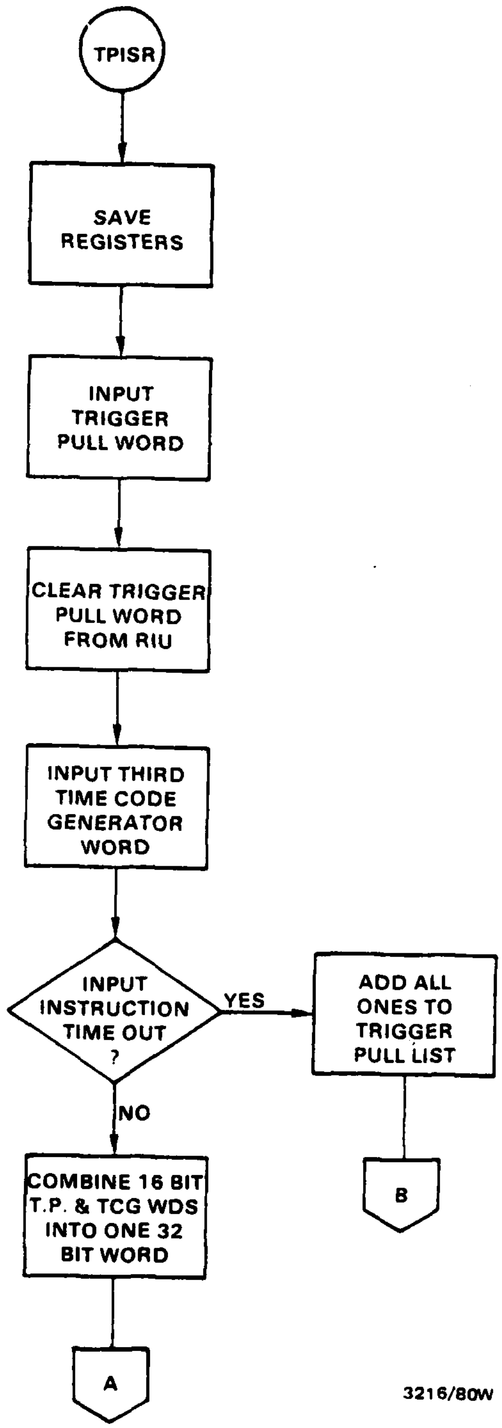


Figure V-4. TPISR Flowchart

6. RIUDCD

a. Purpose:

The RIUDCD Module decodes the raw RIU input data. The user supplies the input array in the prescribed order. RIUDCD then converts the data to binary 2's complement numbers and stores them in the user supplied output array. The discretes are packed and stored as defined in this abstract.

b. Input:

The raw RIU data is input in the following order.

WORD 1 Days and Status from the time code generator
WORD 2 Hours, Minutes, and Tens of Seconds
WORD 3 Seconds and Fractions of Seconds
WORD 4 16 LSBS of Azimuth Encoder
WORD 5 16 LSBS of Elevation Encoder
WORD 6 MSBS of Az and El
WORD 7 Discretes and Az Servo Error
WORD 8 Elevation Error
WORD 9 Spare Word
WORD 10 Discretes and BCD Source Code

All words are 16 bits long.

c. Output:

The output array is ordered in half words as follows:

WORD 1,2 Azimuth Ø to 36Ø; 17 significant bits.
WORD 3,4 Elevation + 9Ø to -90; 17 significant bits.
WORD 5,6 Spares
WORD 7 Days from the time code generator in BCD
WORD 8 Hours, Minutes and Tens of Seconds in BC
WORD 9 Seconds and Milliseconds in BCD
WORD 10 Azimuth Servo Error; 2's complement (4 bytes)
WORD 11 Elevation Servo Error; 2's complement (4 bytes)
WORD 12 BCD Source Code in Binary
WORD 13 Discretes packed as follows:
BIT Ø On time from code generator (TCG)
BIT 1 Hold from TCG
BIT 1 MTU ON-OFF
BIT 4 Narrow-Wide Field of View
BIT 5 Auto-Track
BIT 6-15 Spare
BITS are numbered 0-15 left to right.

d. <u>Algorithm</u>:

See Figure V-5 for flowchart.

e. <u>Calling Sequence</u>:

```
BAL   RF, RIUDCD
DAC   Address of Input Array
DAC   Address of Outut Array
Return here
```

f. <u>Subroutines Used</u>:

None

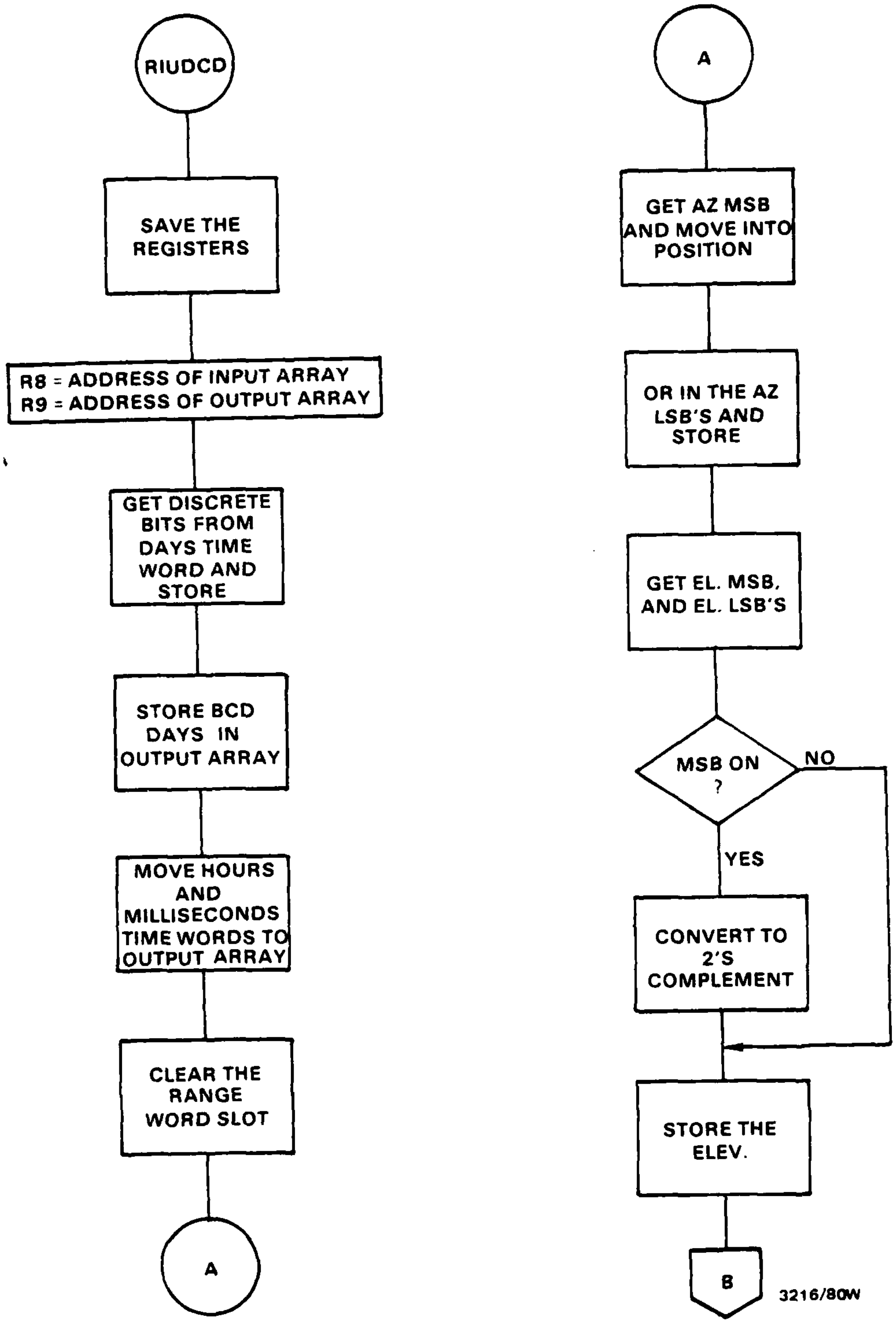
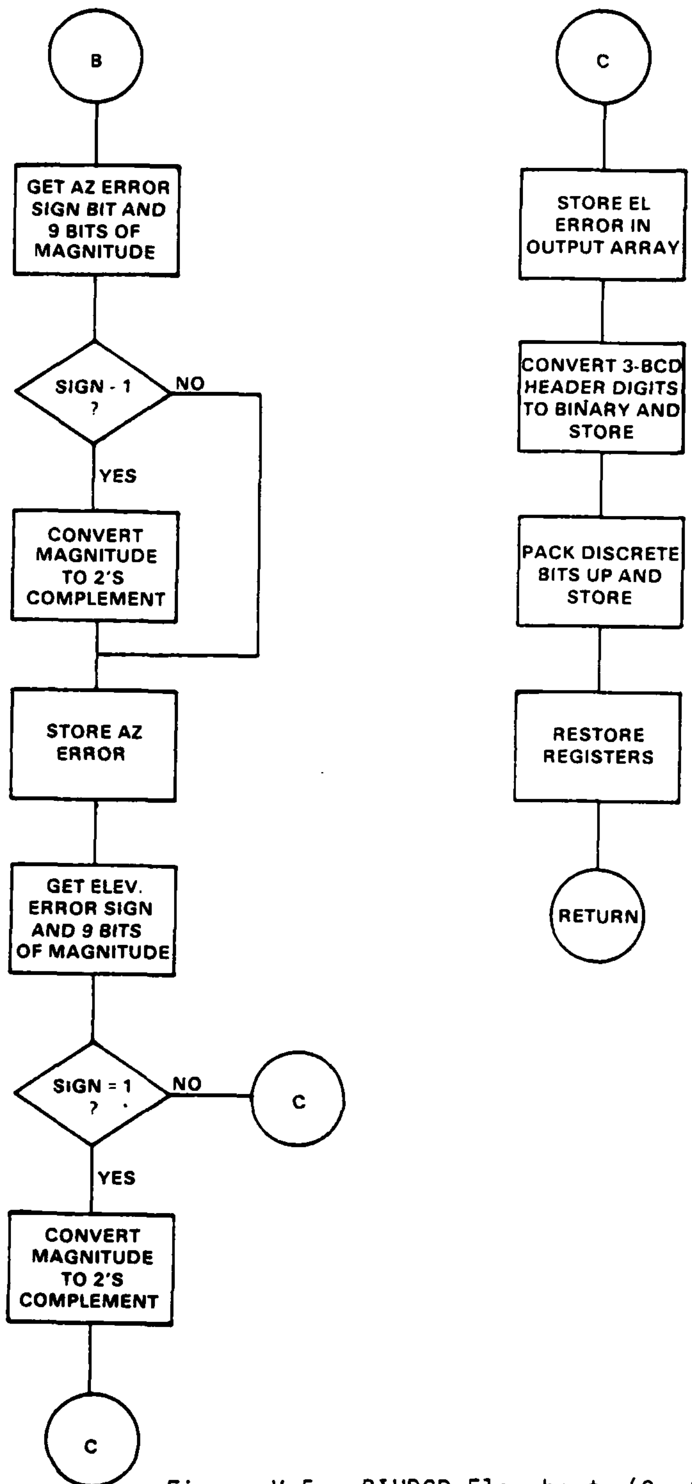


Figure V-5. RIUDCD Flowchart



3216/80W

Figure V-5. RIUDCD Flowchart (Continued)

7. ADDCD

a. Purpose:

This module right justifies the A/D data. The input has each A/D in a single 16 bit word with 3 extra bits. This routine eliminates those 3 bits and stores the data in the output array.

b. Input:

Array of 16 bit A/D words from the A/D converter board.

c. Output:

Six 16 bit half words with all data right justified.

d. Algorithm:

See flowchart in Figure V-6.

e. Calling Sequence:

```
BAL RF, ADDCD
DAC  ADDRESS OF INPUT ARRAY
DAC  ADDRESS OF OUTPUT ARRAY
RETURN HERE
```

f. Subroutines Used:

NONE

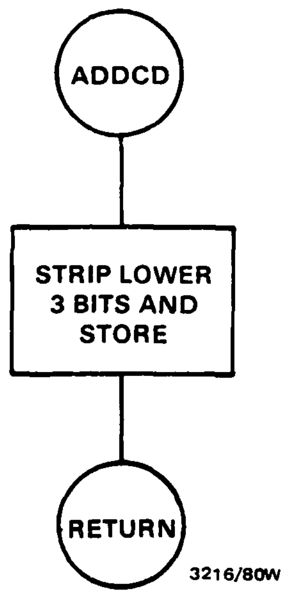


Figure V-6. ADDCD Flowchart

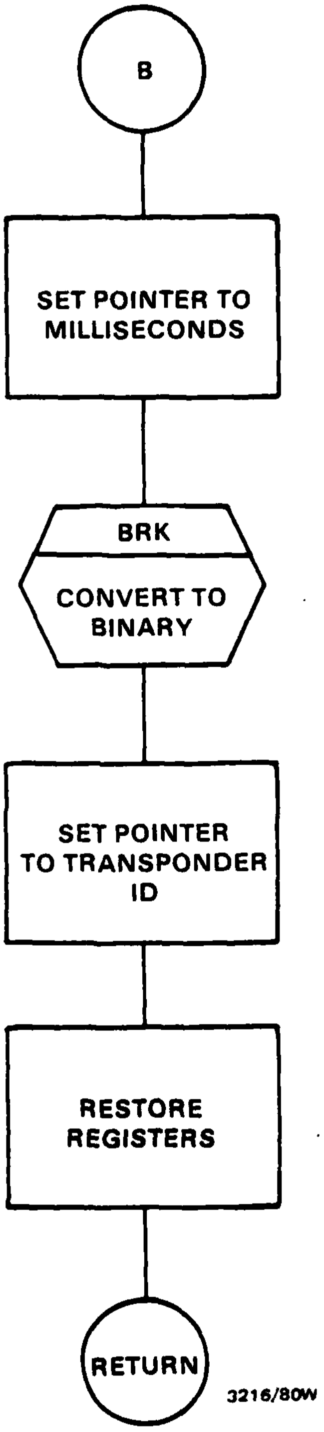


Figure V-6. ADDCD Flowchart (Continued)

8. MMRDCD

a. Purpose:

THIS MODULE DECODES THE MOTOROLA MINI-RANGER DATA WHICH IS INPUT VIA THE 4800 BAUD ASYNCH DATA LINK. THE DATA IS INPUT IN PACKED BCD AND DECODED TO BINARY VALUES.
THE RANGE WORDS ARE DECODE TO FULL 32 BIT WORDS.
THE REMAINDER OF HTE DATA IS DECODE TO HALF WORDS (16 BIT).
THE INPUT MESSAGE IS 13 BYTES LONG.
THE OUTPUT DATA OCCUPIES 11 HALF WORDS.

b. Inputs:

THE INPUT MESSAGE IS STRUCTURED AS FOLLOWS:
BYTE 1 SYNCH CHARACTER 1 (226 OCTAL, SYN CODE IN ASCII).
BYTE 2 SYNCH CHARACTER 2, SAME AS ABOVE.
BYTE 3 RANGE A MDS'S IN BCD.
BYTE 4 MORE OF RANGE A.
BYTE 5 LSD OF RANGE A AND MSD OF RANGE B.
BYTE 6 MORE OF RANGE B.
BYTE 7 LSD'S OF RANGE B.
BYTE 8 TARGET ID, 2 BCD DIGITS.
BYTE 9 HOURS OF D.
BYTE 10 MINUTES.
BYTE 11 SECONDS.
BYTE 12 FRACTIONS OF SECONDS.
BYTE 13 TRANSPONDER ID AND PAD.

c. Output:

THE OUTPUT ARRAY IS TORED FOR THE USER IN THE FOLLOWING ORDER:
WORD 1 HOURS OF BINARY.
WORD 2 MINUTES.
WORD 3 SECONDS.
WORD 4 FRACTIONS.
WORD 5 TARGET ID.
WORD 6 TRANSPONDER ID.
WORD 7,8 RANGE A FULL WORD.
WORD 9,10 RANGE B FULL BINARY WORD.
WORD 11 SYNCH CHARACTER 1.
WORD 12 SYNCH CHARACTER 2.

d. Algorithm:

See Figure V-7 for flowchart.

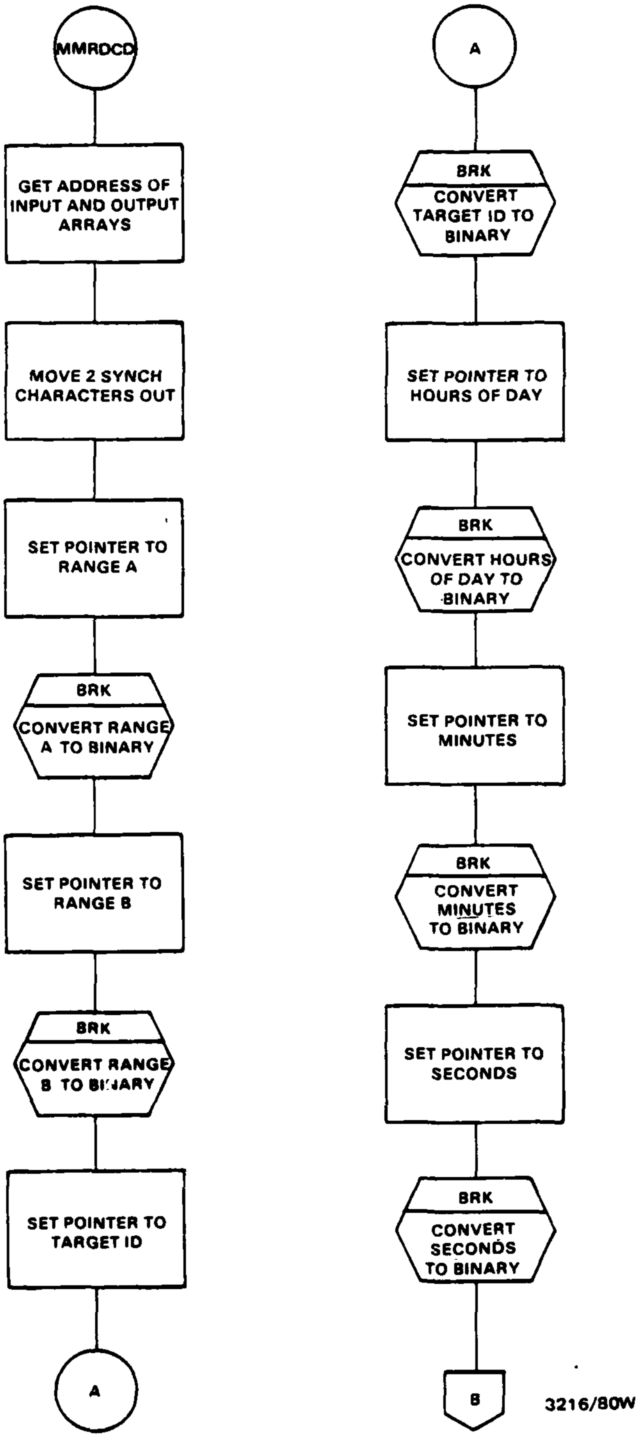


Figure V-7. MMRDCD Flowchart

e. Calling Sequence:

```
BAL    R15,MMRDCD CALL THE DECODE.
DAC    ADDRESS OF THE INPUT ARRAY.
DAC    ADDRESS OF THE OUTPUT ARRAY.
RETURN HERE.
```

f. Subroutines Used:

BRK(LOCAL)

NOTE: NO REGISTERS SAVED

9. BRK

a. Purpose:

BRK converts the requested number of nibbles (4 bits) to binary from packed BCD. The user supplies the absolute byte address, the number of nibbles to process, and a flag to indicate which nibble, upper or lower is to be processed first. The result is returned to the user in RB.

b. Input:

R8 = The address of the most significant byte.
R7 = 1 Start with Bits 24-27
 = Ø Start with Bits 28-31
R6 = The number of nibbles to process

c. Output:

R8 (R11) = The sum of the processed digits in Binary.

d. Algorithm:

See flowchart in Figure V-8.

e. Calling Sequence:

Load the Registers.
BAL RF, BRK
Return here; answer in R11.

f. Subroutines Used:

None

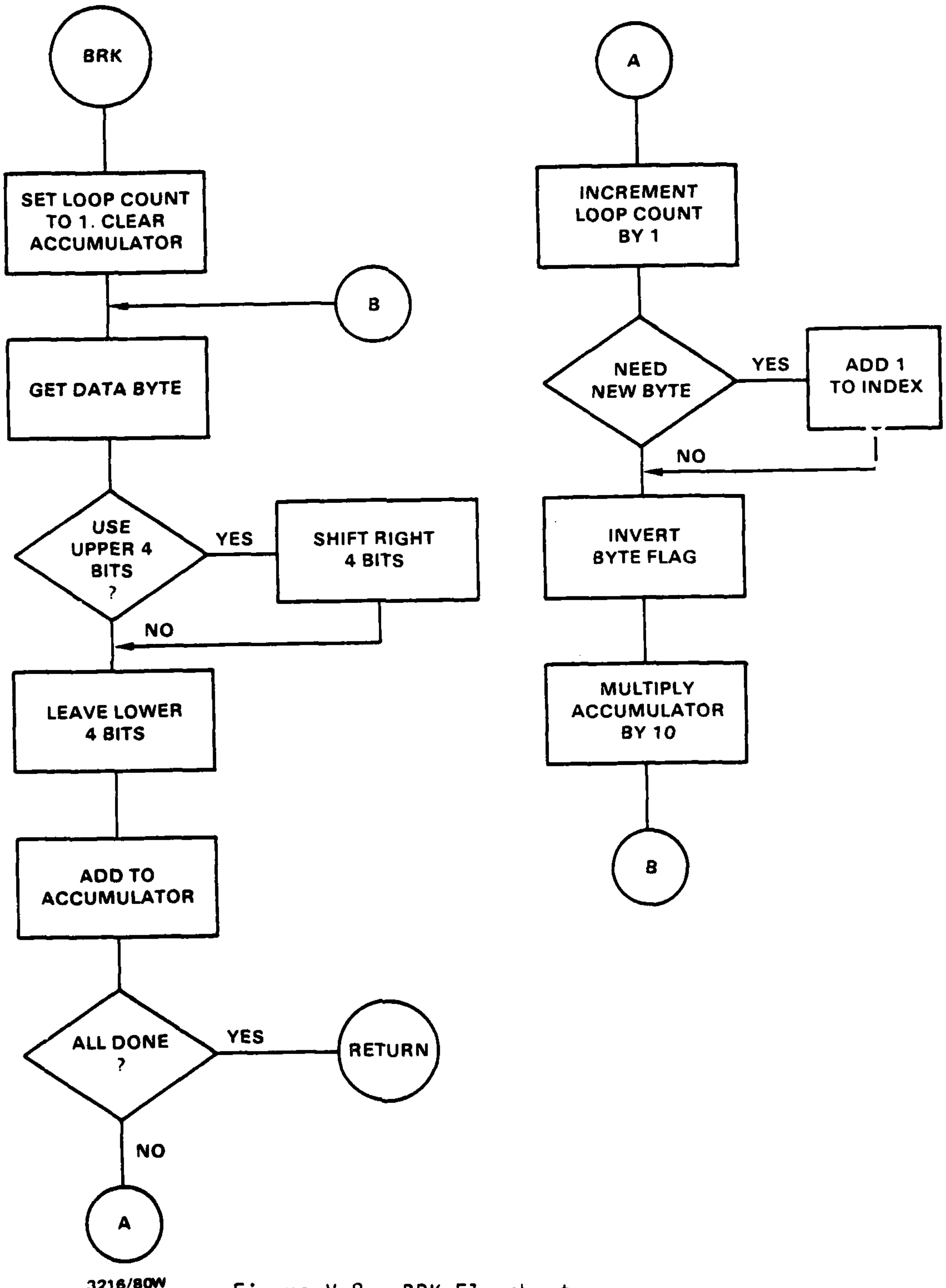


Figure V-8. BRK Flowchart

10. TIMCON

a. Purpose:

WIDTH 80
THIS MODULE UNPACKS THE 3 TIME WORDS INPUT FROM THE DATUM 9310 TIME CODE TRANSLATOR/GENERATOR.
THE OUTPUT IS IN BINARY.

b. Input:

THE INPUT DATA IS STRUCTURED AS FOLLOWS:
WORD 1 STATUS BIT AND DAY OF YEAR.
WORD 2 HOURS, MINUTES, AND TENS OF SECONDS.
WORD 3 UNITS OF SECONDS AND MILLISECONDS.

c. Output:

THE OUTPUT ARRAY IS STRUCTURED AS FOLLOWS:
WORD 1 DAY OF YEAR IN BINARY
WORD 2 HOURS IN BINARY
WORD 3 MINUTES OF HOURS IN BINARY
WORD 4 SECONDS OF MINUTES IN BINARY
WORD 5 MILLISECONDS OF SECONDS IN BINARY

d. Algorithm:

See Figure V-9 for flowchart.

e. Calling Sequence:

```
BAL     R15,TIMUNPK
DAC     INPUT ARRAY ADDRESS
DAC     OUTPUT ARRAY ADDRESS
RETURN HERE
```

f. Subroutines Used:

BCDBIN(LOCAL).

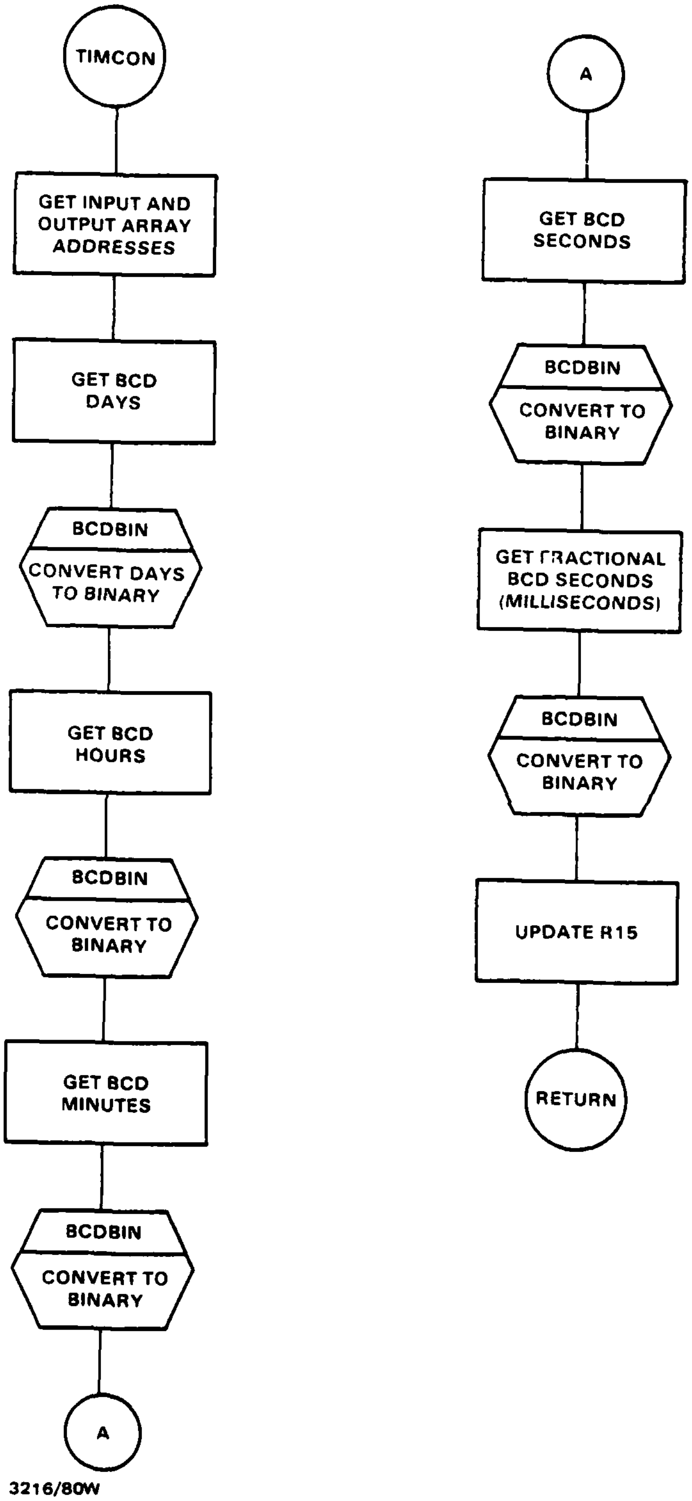


Figure V-9. TIMCON Flowchart

11. BCDBIN

a. Purpose:

This module converts a maximum of 3 BCD digits to Binary.

b. Input:

R10 contains the BCD digits right justified.

c. Outputs:

The number is returned to the user in R10 in binary.

d. Algorithm:

SUM = ((MSD)*10 + NMSD)*10 + LSD. See Figure V-10.

e. Calling Sequence:

```
BAL   R15,BCDBIN
Return here, answer is $10.
```

NOTE: R11 is destroyed.

f. Subroutines Used:

None.

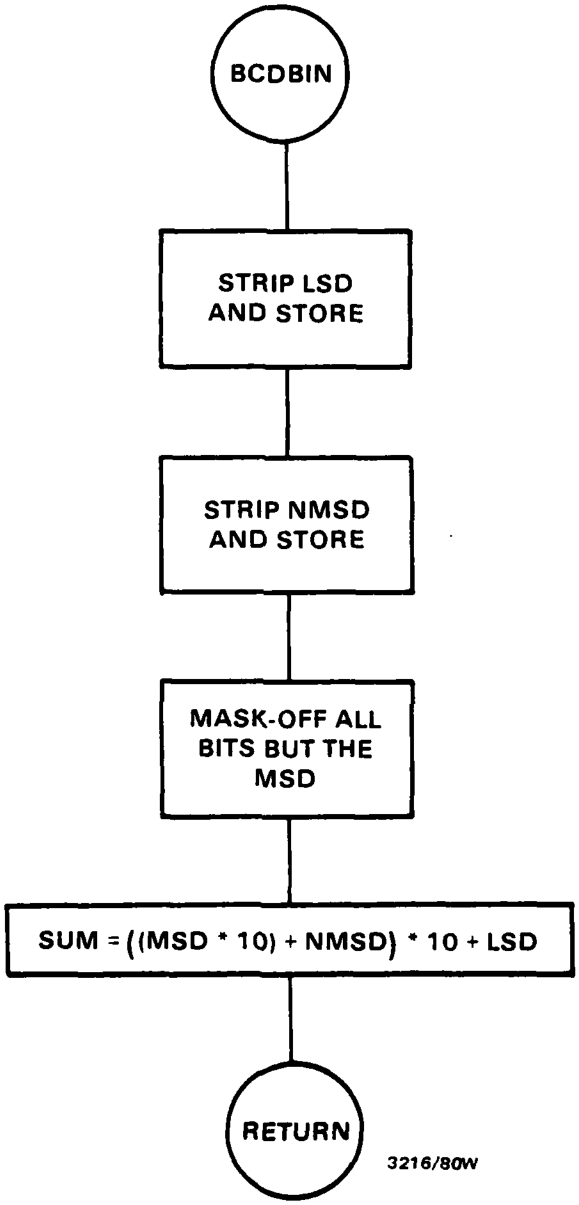


Figure V-10. BCDBIN Flowchart

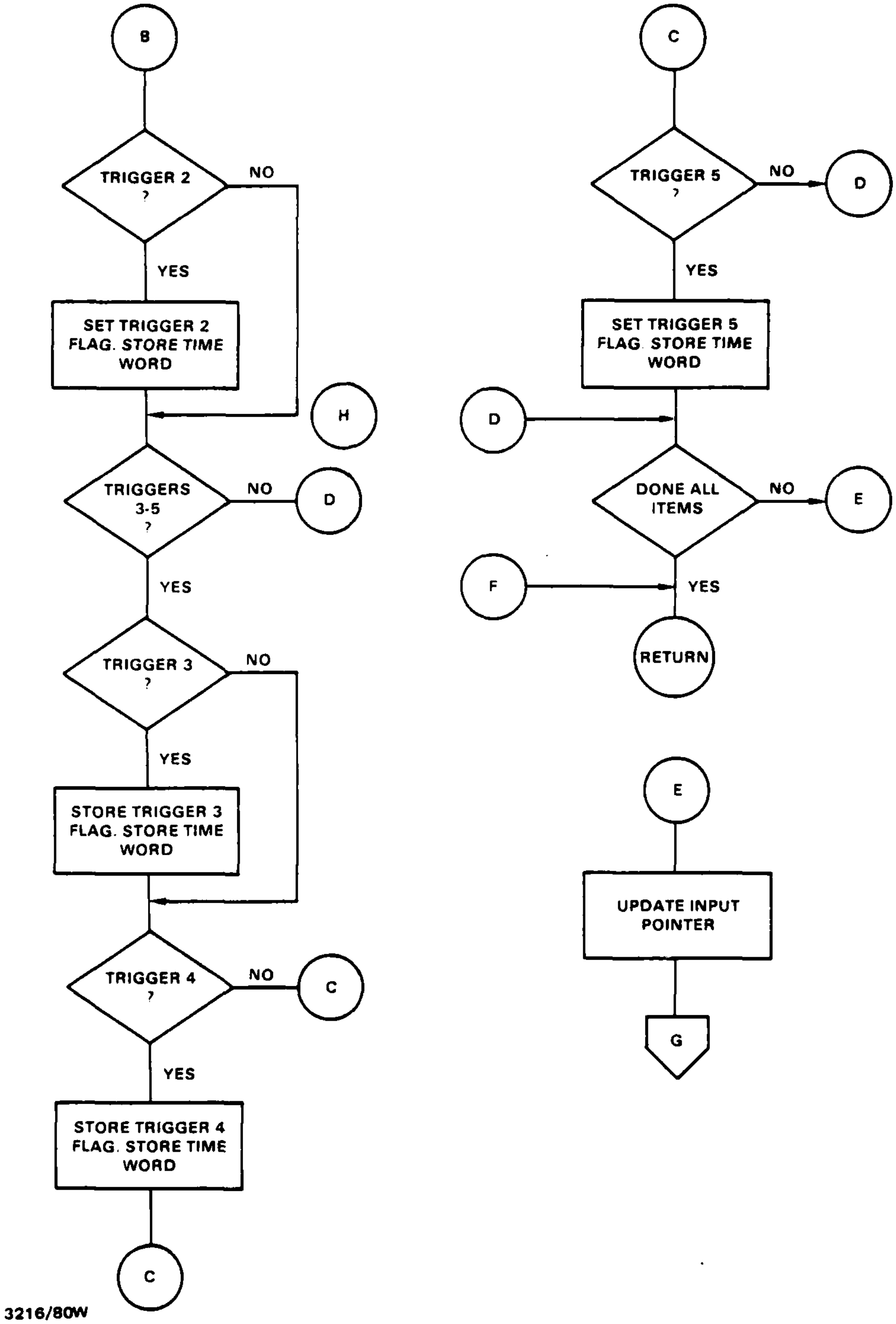


Figure V-10. BCDBIN Flowchart (Continued)

12. TPDCD

a. Purpose:

This module decodes the trigger pull inputs.
The input is a stack with the number of entries as the first half world. The stack count indicates the number of items in the stack. An item is composed of two half words, the first being the trigger pull mask and the second being the time when that trigger pull word was input. The time word is the third time word from the time code generator which has the milliseconds of second in it. The stack should not have milliseconds of second in it. The stack should not have more than 4 items in it due to the duration and frequency of the pulses.
The output array has a half word to indicate whether that trigger fired in this 50 millisecond frame. When a trigger has fired, this word is set to a one. The second word contains the fractional seconds of the second when the trigger fired in binary.

b. Inputs:

The input array is structured as follows:
Word 0 Number of items in the stack.
Word 1 Oldest trigger pull value.
Word 2 The BCD time word when the trigger was plulled.
Word N Last item in the stack.
Word N+1 Time of Last firing

c. Output:

The output array is structured as follows:
Word 0 Trigger 0, 1 = fired, 0 = no fire.
Word 1 Time in Binary of Latest firing.
Word 11 Trigger Pull 5.
Word 12 Time of firing.

d. Algorithm:

See flowchart in Figure V-11.

e. Calling Sequence:

```
BAL   RF,TPDCD
DAC   Address of Stack
DAC   Address of Output Array
Return here, all registers are destroyed.
```

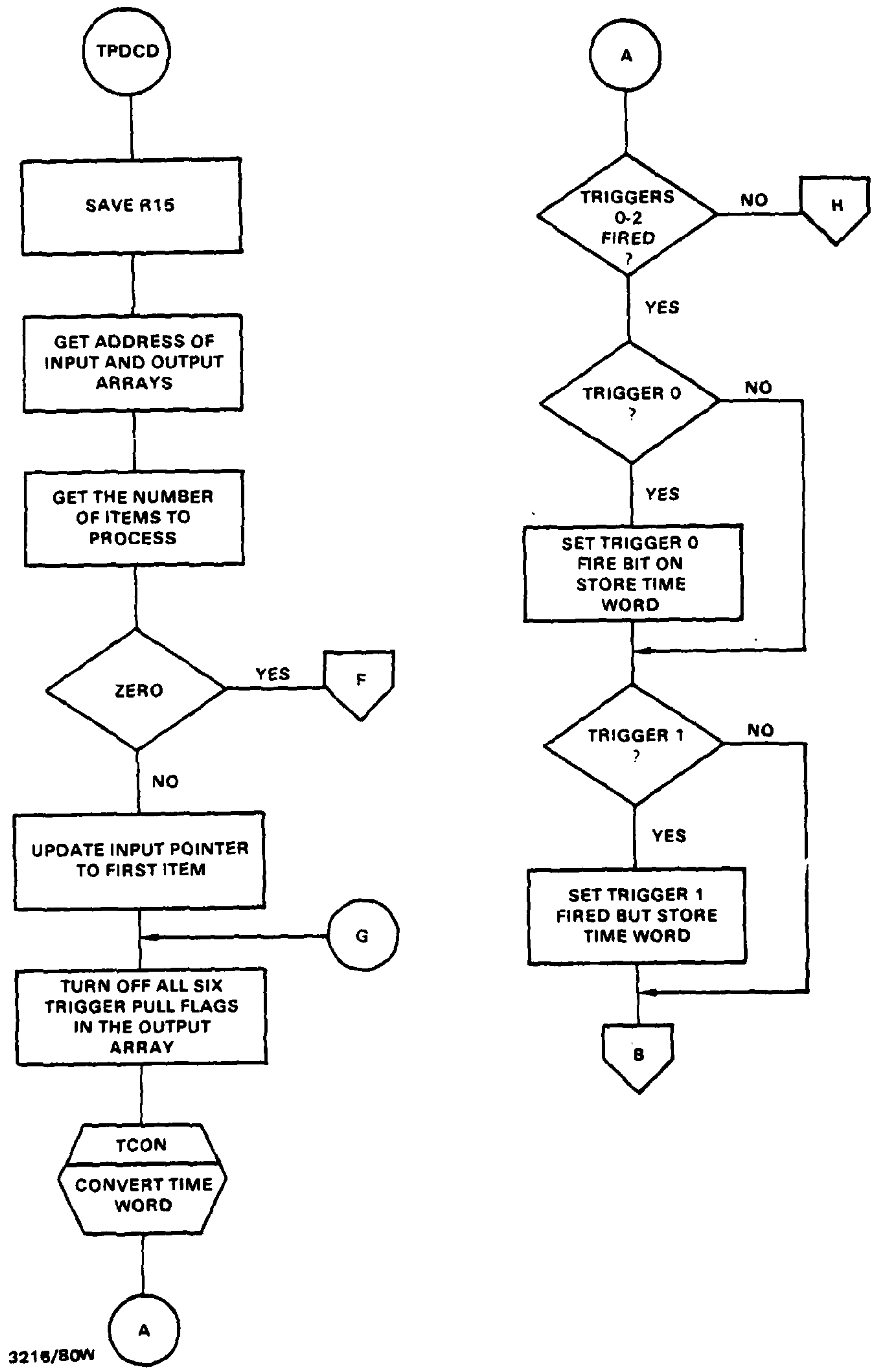


Figure V-11. TPDCD Flowchart

f. Subroutines Used:

TCON(LOCAL)

NOTE: All registers are destroyed.

13. TCON

a. Purpose:

This module converts the three BCD digits from the time word to binary. The input is in register RA, and so is the output.

b. Input:

The time word is input in RA. Its format is as follows:
BITS 16-19 Integer seconds in BCD.
BITS 20-23 Tenths of seconds in BCD.
BITS 24-27 Hundredths of seconds in BCD.
BITS 28-31 Integer milliseconds in BCD.
No other BITS are processed.

c. Output:

Register RA contains the binary sum of fractional seconds.

d. Algorithm:

Sum = (Tenths *10 + Hundredths of Seconds) *10 + Thousandths of seconds. See flowchart in Figure V-12.

e. Calling Sequence:

```
L    RA,TIMWORD
BAL  RF,TCON
Return here, sum is in RA.
```

f. Subroutines Used:

None

NOTE: RB is destroyed. Time = 38.13 MIKES.

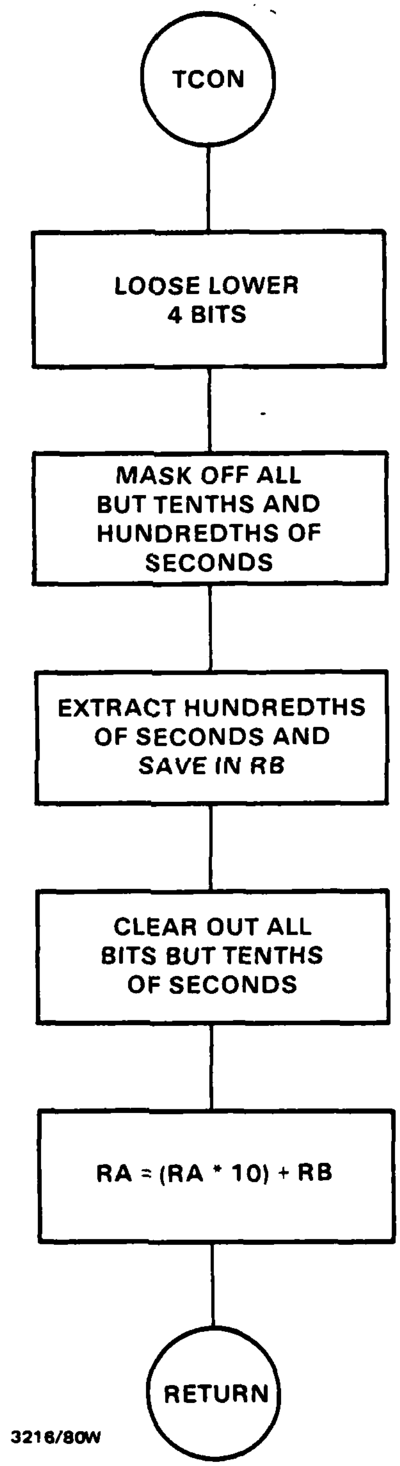


Figure V-12. TCSN Flowchart

14. FMT-ASC, FMT. EBC

a. Purpose:

This is a generalized output formatter. It is the same as ENCODE but minus the restrictions. and like ENCODE, it is a core transfer. The user supplies the data area, the data address, and the output format specification. The data may be output in either ASCII or EBCDIC, depending on the entry called.

b. Inputs:

The address of a table which contains the following information:

TABLE WORD 1 The users buffer address
TABLE WORD 2 The address of an error return
TABLE WORD N The address of the input data
TABLE WORD N+L The various control codes as follows:

BYTE Ø The Data conversion code
0 = Literals; Max of 80 characters
1 = 16 bit hex values; max of 4 characters
2 = 32 bit hex values; max of 8 characters
3 = 16 bit decimal value, no sign. Max of 5 char.
4 = 16 bit decimal value, with sign. Max of 6.
5 = 32 bit decimal value, no sign. Max of 10 char.
6 = 32 bit decimal value, with sign. Max of 11 char.
7 = Termination of call. causes control to be returned to the user.
8 thru 15 are not used.
Byte 1 is the field width (255 max.).
Byte 2,3 the position where the characters are to be stored.

An item looks like this:

Variable address; 1 word	: cc : FW : PWP 16 BITS
1 WORD (32 BITS).	8 BITS: * BITS: 16 BITS
Dac DOG	Db cc, FW Dc H'PWP'

THUS AN ITEM TAKES TWO 32-BIT WORDS.

c. Outputs:

The data is converted and stored until either a termination code is found or an error is detected. In case of an error, the error flag

is set non-zero with a code indicating the type of error. The item number where the error is found is also stored. When the termination code is detected, the error flag is set to zero and control is returned to the user. The error codes are:

CC 1
FW 2
PWP 3
Not implemented 4
Normal Terminaton Ø

d. Algorithm:

See flowchart depicted in Figure V-13.

e. Calling Sequence:

```
BAL  R15,FMT, ASC OR FMT EBC
DAC  ADDRESS OF THE REQUIRED TABLE
DAC  ADDRESS OF THE FULL WORD ERROR FLAG CELL
DAC  ADDRESS OF THE FULL WORD ITEM NUMBER SLOT
RETURN HERE
```

f. Subroutines Used (External)

None

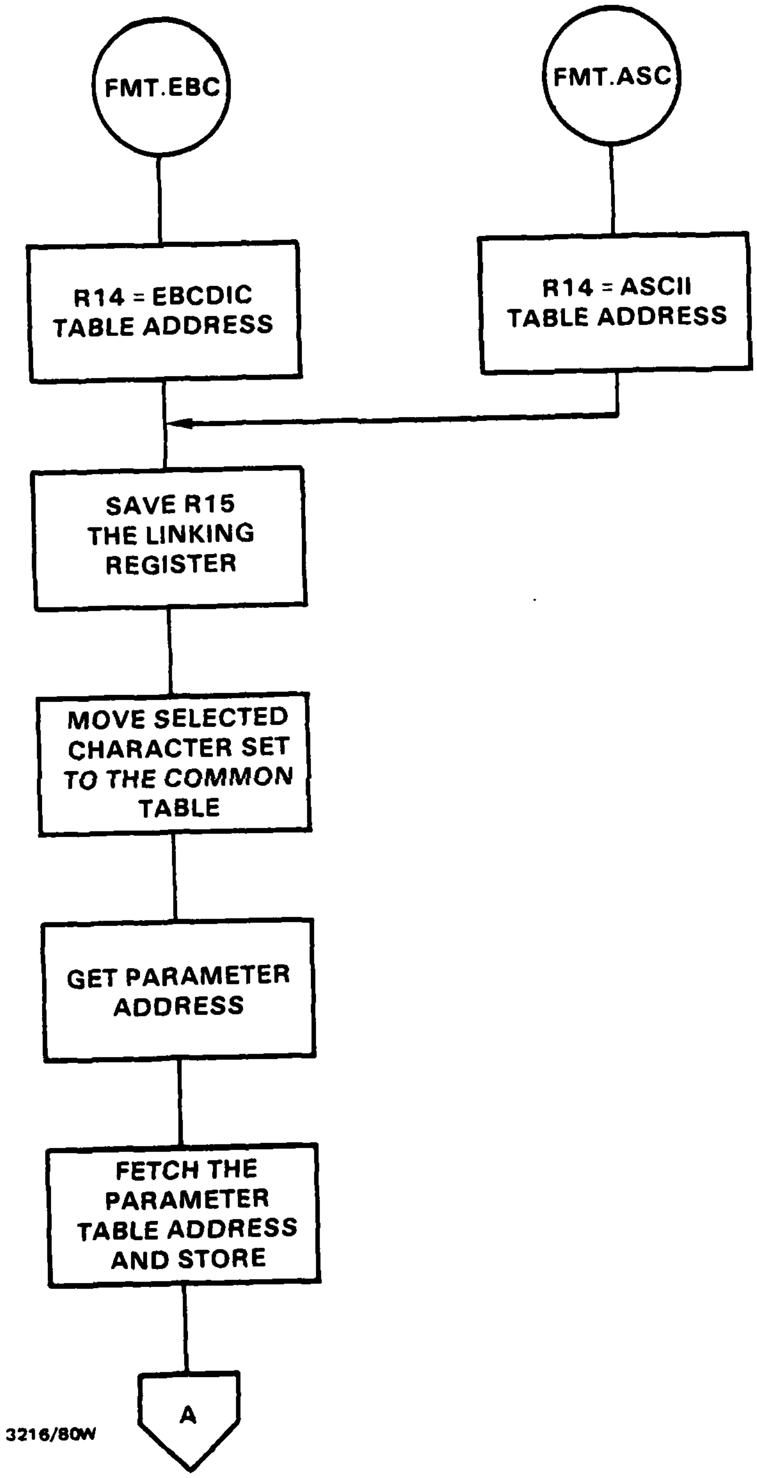


Figure V-13. FMT-ASC, FMT, EBC Flowchart

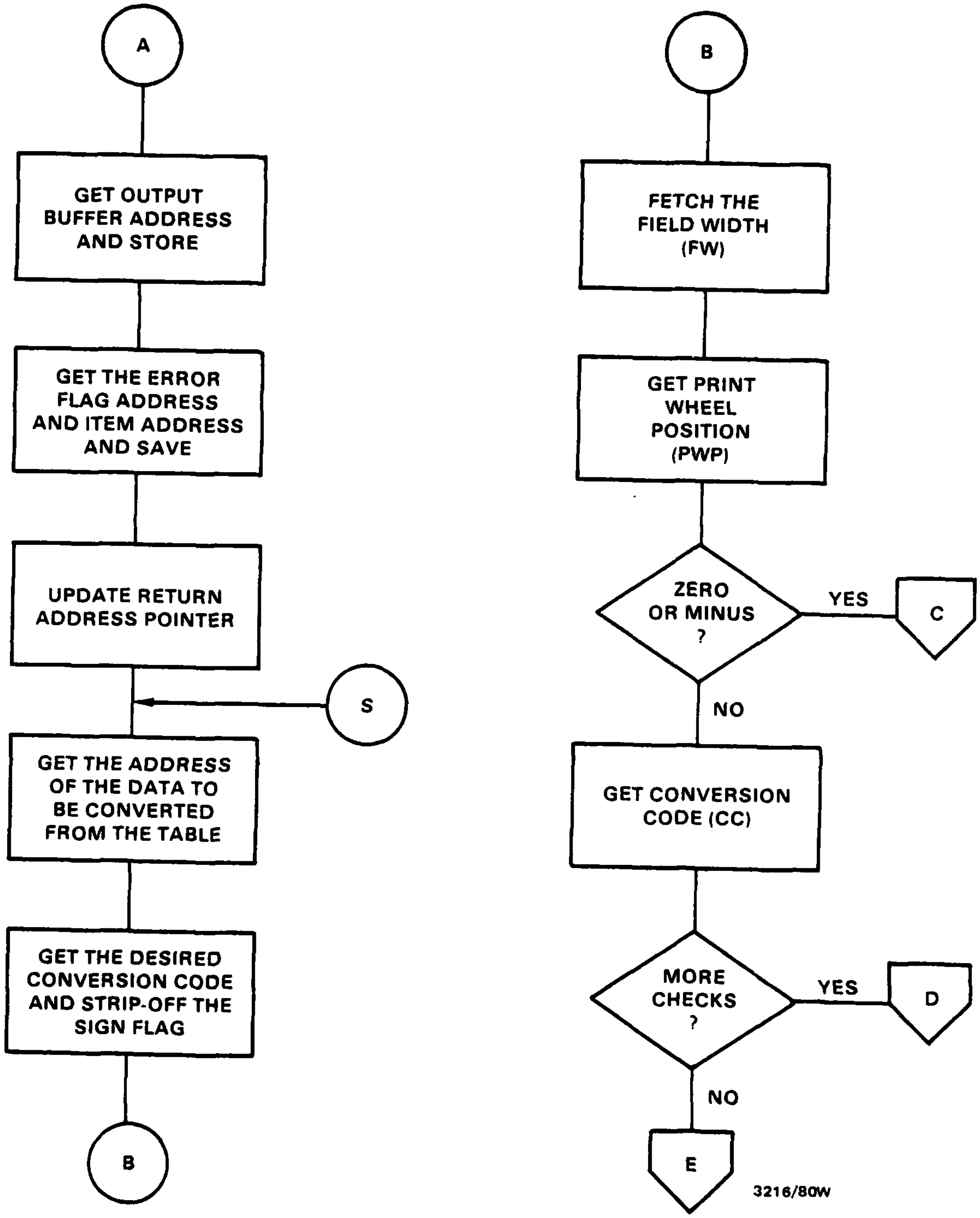


Figure V-13. FMT-ASC, FMT, EBC Flowchart (Continued)

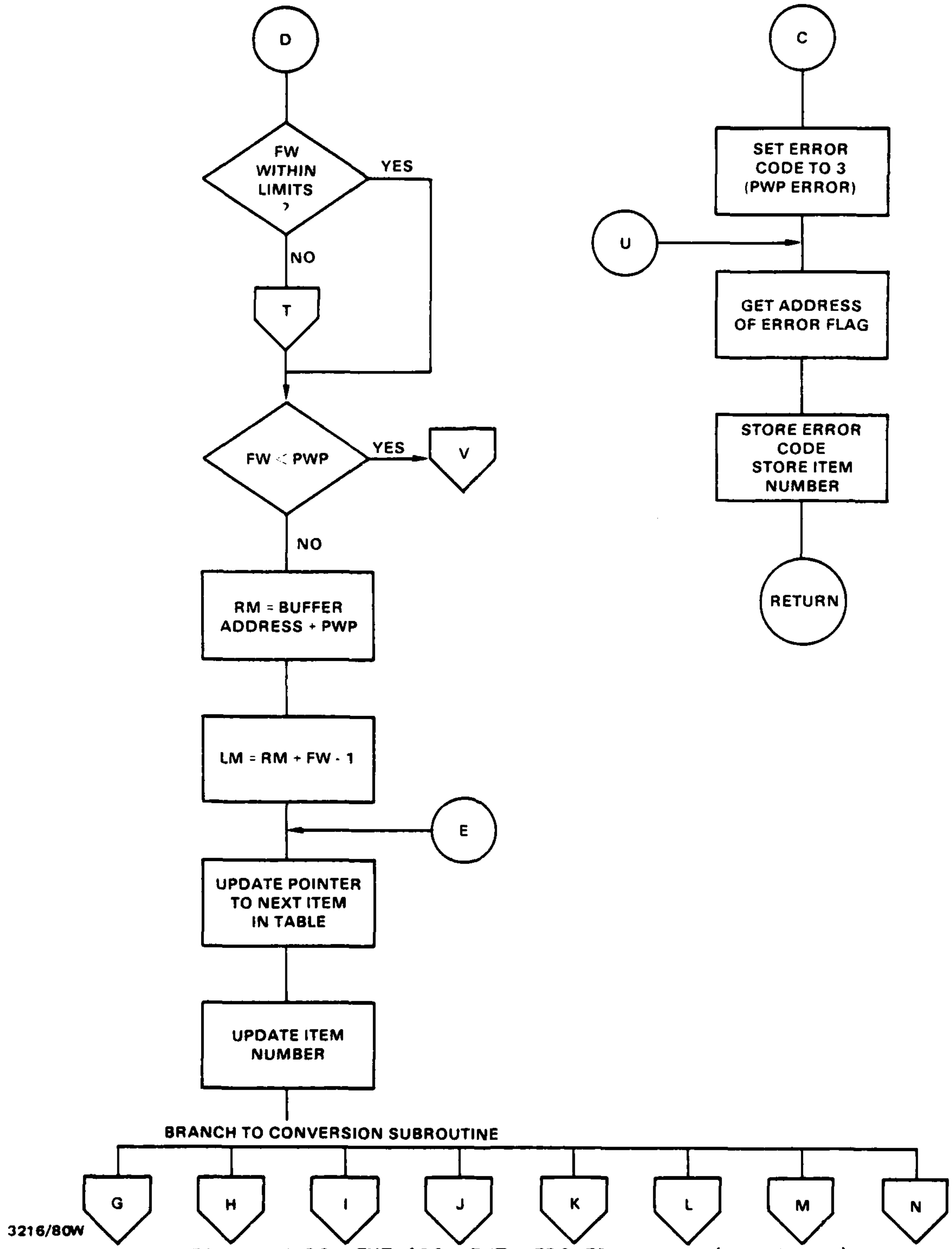


Figure V-13. FMT-ASC, FMT, EBC Flowchart (Continued)

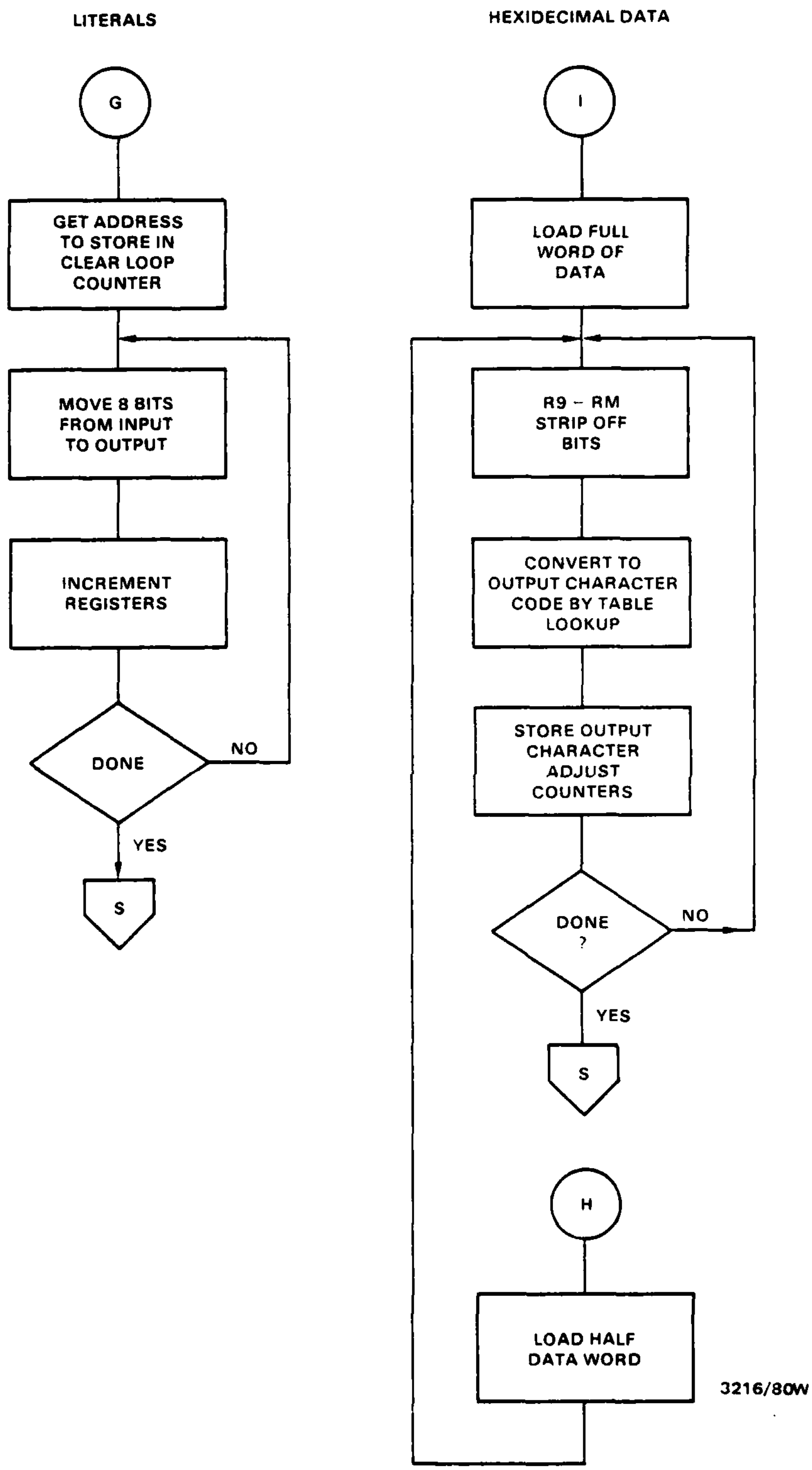


Figure V-13. FMT-ASC, FMT, EBC Flowchart (Continued)

AD-A104 790 BDM CORP MCLEAN VA F/G 17/8
VIDEO AUTOMATIC TARGET TRACKING SYSTEM (VATTS) OPERATING PROCED--ETC(U)
AUG 80 C STAMM, J FORRESTER, J WINBURN DABT23-81-C-0240
UNCLASSIFIED BDM/W-80-460-TR NL

2 of 2
AD A
104790

END
DATE
FILMED
11-81
DTIC

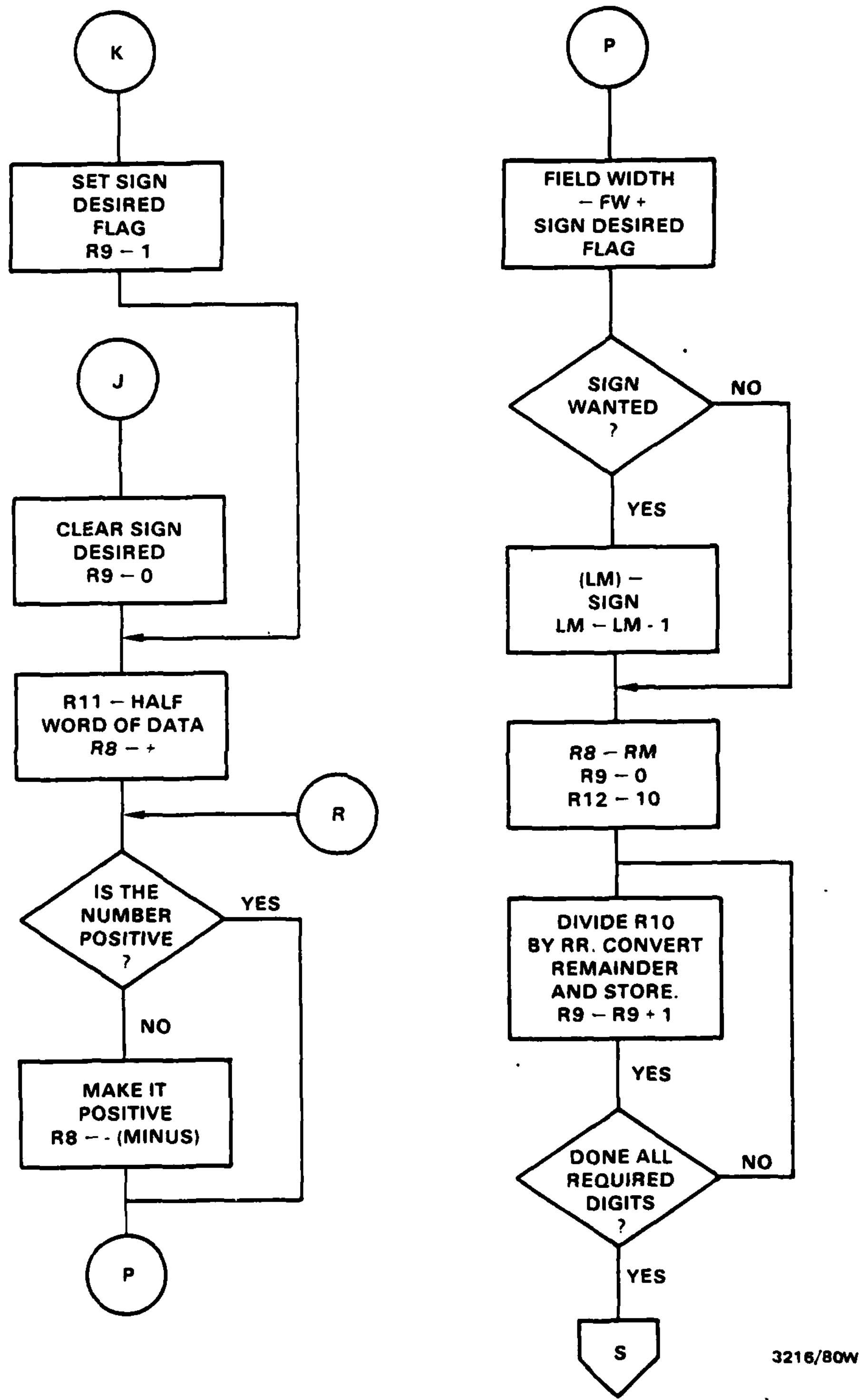


Figure V-13. FMT-ASC, FMT, EBC Flowchart (Continued)

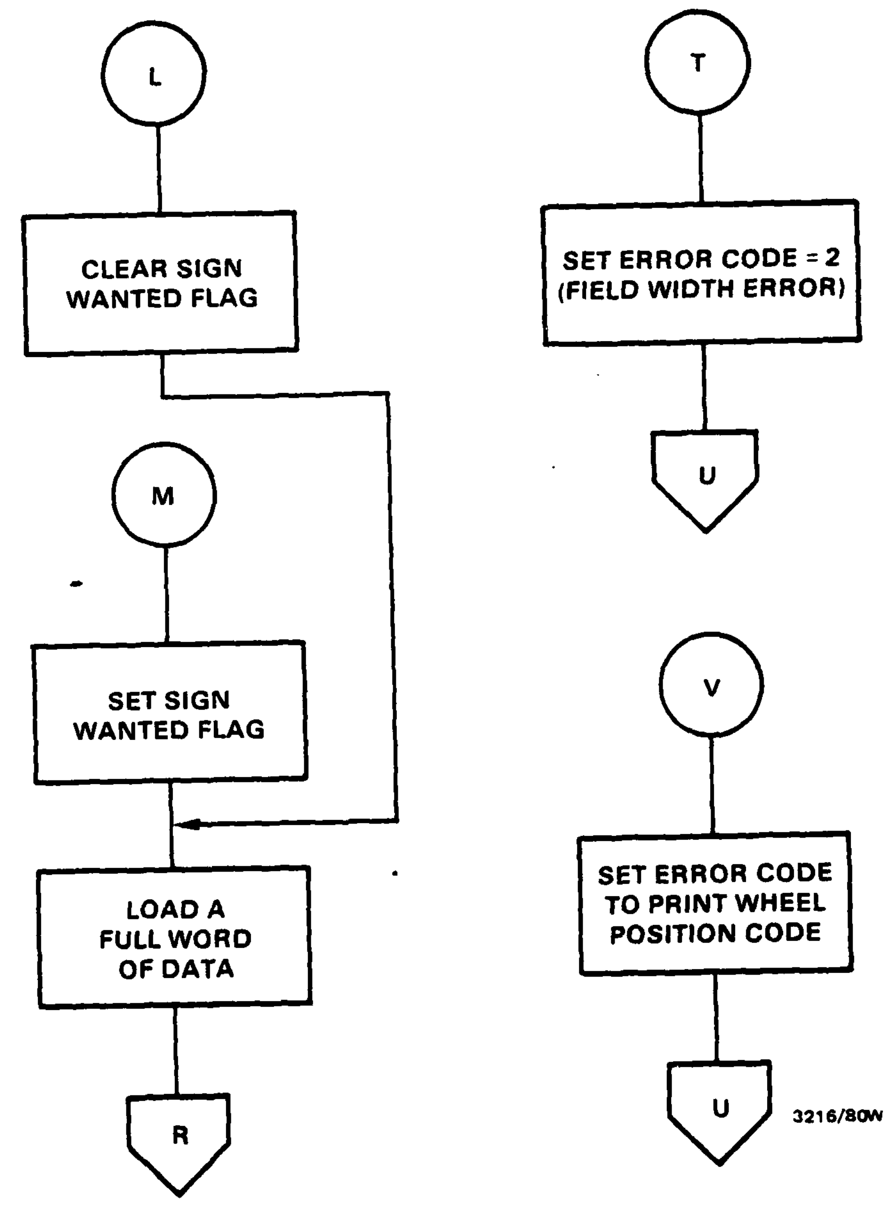


Figure V-13. FMT-ASC, FMT, EBC Flowchart (Continued)

SECTION VI

OPERATOR HELPS

SECTION VI
OPERATOR HELPS

A. INTRODUCTION

This section points the user to the correct manuals to solve problems that are encountered in day to day operation. The reader must be familiar with the OS/32ST PROGRAM REFERENCE MANUAL sections 2 and 5. The operation of the Hexadecimal Display Panel is described in the INTERDATA 7/32 PROCESSOR USER'S MANUAL, Section 5. The user is encouraged to try the various procedures.

When first attempting these procedures, make sure that the disk is protected at the hardware level, i.e., the PROT FIXD and PROT RMVBL rocker switched are in the UP position and the lamps on. This prevents all writing on the disk and ensures its integrity.

B. POWER UP

1. Insure that the CPU is turned off on the Hexadecimal Display Panel.
2. Turn on the AC regulators. This should apply power to most subsystems.
3. Make sure that there is a removable disk in the disk drive and that it is correctly loaded.
4. Apply power to the disk by the POWER switch on the disk front panel. If the power switch does not illuminate, check the back of bay to see if the disk is plugged in. If the disk still does not come up, refer to the INTGR DATA M46-416 REMOVABLE CARTRIDGE DISC SYSTEM MAINTENANCE MANUAL.
5. The LOAD/RUN switch on the disc front panel should be in the LOAD position.
6. The load tight will come on and a distant CLICK will be heard after power is applied to the disc. THIS IS NORMAL.

7. Press the RUN/LOAD switch to the RUN position. This is a switch only. It is never illuminated.
8. The disc now begins to come up to speed. This may take several seconds. The READY light should come on. If it does not light, the disc drive either did complete its initial sequence <u>OR</u> the disk pack is cold. Wait 5 minutes. If the disc is still not ready, push the RUN/LOAD switch back to LOAD. Then retry the disc start up sequence.
9. Now turn the PROT FIXD switch to the <u>down</u> position. This unprotects the fixed 5MB platter. If the PROT FIXD switch does not go out, the disc is still warming up.
10. On the Loader Storage unit, flip the ENABLE switch to the enable position. This allows the LSU to be accessed by the CPU.
11. On the HEXADECIMAL DISPLAY PANEL, turn the key to ON.
12. Verify on the TK1 that the operating system signs on with the *OS/32ST message.
13. If the message does NOT appear check the following:
    a. Is the Disc Ready Light ON?
       If <u>NOT</u> go 3.
    b. Is the LSU switch in the ENABLE position? If <u>NOT</u> go J.
    c. If the HEXADECIMAL DISPLAY PANEL has 'CODE 0102' TK1 is not on or is not connected to the CPU. Correct the condition and toggle the INIT switch on the LSU.
    d. If the disk was not accessed, it sounds like a coffee pot perking, the bootstrap was not installed correctly. Go to the procedure on how to install the bootstrap in this section.

C. <u>POWER DOWN</u>

1. On TK1, make the following entries:

   * <u>RES CL<CR></u>
   * <u>MARK DS1:, OFF<CR></u>
   * <u>MARK DSØ:, OFF<CR></u>
   *

2. On the front panel of the DISC, turn on the PROT FIXD, and PROT CART switches on. Then set the RUN/LOAD switch to the LOAD position. Wait for the READY/LOAD indicator to light the LOAD status. A distinct click will be heard.
3. On the HEXADECIMAL DISPLAY PANEL, turn the KEY to the OFF position.
4. On the A/C regulators, turn the switch to the OFF position. Be sure the tracking mount is stowed with the pins in the lock positions.

   NOTE: If the DISC cannot be marked off, there is a disc file open. The user should run DISC CHECK to close all files.

D. <u>OS/32 ST INITIALIZATION</u>

1. On the disc front panel, turn the rocker switch PROT FIXD up to the off position. This allows the software to write on the disc. Wait until the PROT FIXD switch light goes out. When the disc is warming up, changing the position of this switch will <u>NOT</u> cause the light to go out. When the disc is warmed up, the rocker switch will have the desired effect.

   If data or programs are to be used from the top removable cartridge, protect that disc also.
2. On TK1

   * <u>MA DSØ:, ON<CR></u>

   * <u>MA DS1:, ON<CR></u> (only if this one is to be used)

   *

   NOTE: If the disc cannot be marked on, run DISC CHECK.
3. The system is now ready for use.

E. WHEN THE DISC CANNNOT BE ACCESSED

Check the following items:

1. Is the disc powered up and the Ready light on? If not reference A.
2. Is the disc platter being read, unprotected? If not reference A.
3. Is the disc marked on? Verify the disc status by requesting via TK1

   * D D<CR> (display devices)

   *

   If the disc is marked ON, run DISC CHECK, reference para F-12.
   If the disc is NOT marked ON, reference para F-4. Then try to run the system. If all of the above, the system will not run, the disc must be reloaded from magnetic tape.

F. HOW TO BACK UP THE SYSTEM TO TAPE

1. Mount a magnetic tape on MAG1 with a write ring in it.
2. Make sure the tape is at LOAD point and ON-LINE.
3. On TK1, enter

   * DUMP2<CR>

   *

4. The DUMP2 starts a high level command string. This procedure uses the DISC COMPRESS program. When the compression is complete, the tape is verified. At the end of the verification, the program outputs the message

   $ DUMP COMPLETE - REMOVE TAPE

   and rewinds the magnetic tape.

G. SYSTEM CRASH

All system crash codes are listed in the OS/32 ST PROGRAM REFERENCE MANUAL, Sections 2.2 and 6. All CRASH codes are output via the Hexadecimal

Display Panel. INTERDATA's restart procedure does not work so the users' only choice is to reload the system using the LSU. The user must then go through systems initialization. If the discs cannot be marked ON, run the DISC CHECK program, refer to H. If the system will not load and run normally, it would be wise to load the disk from the last system DISC COMPRESS.

Practically, if the DISC contains programs which are being changed, the user should immediately copy the disc to tape. Doing this will insure minimum recovery time.

H. RELOADING THE DISC FROM TAPE

The user may reload either one of the 5 MEGABYTE PLATTERS by using the DISC COMPRESS UTILITY.

The 10 megabyte disc consists of a fixed 5 megabyte disc and a removable 5 Megabyte disc. A way of maintaining the disc's integrity is to copy the bottom disc (fixed) to the top disc. Then to copy the top disc out to tape. Thus, the bottom disc is used as primary data and program storage, and a copy of the bottom disc is maintained on both the top disc and a magnetic tape. The next step is to remove the upper disc and replace it with another cartridge. Now all of the disc may be used for storage.

The operator may reload the bottom disc from either the backup cartridge or tape. If the bottom disc is destroyed, the user may load from the top disc, reference how to install bootstrap, I. Using this procedure, the user is sure of maintaining the system on disc while having full backup capability in the form of a digital tape <u>and</u> cartridge disc.

I. HOW TO INSTALL THE LOADER (50 SEQUENCE)

1. Read the Model 7/32 Processor User's Manual, Chapter 10. This explains how to operate the Hexadecimal Display Panel.
2. If the system is running, go through the Power Down C, steps 1 and 2. Do <u>NOT</u> shut down the CPU.

3. On the LSU, put the ENABLE SWITCH down, thus NOT ENABLE.
4. On the Hexadecimal Display Panel depress

FN	(function)
LOC	(location)

This stops the panel. Now press

DTA	(data)
5Ø	(50)
ADD	(50=Current Location)
DTA	(Data)
D5ØØ	(Auto Load instruction)
WRT	(Write D500 at address 50)
DTA	(Clear DTA Register)
CF	(CF)
WRT	(Write 00CF at address 52)
DTA	(Clear Data Register)
43ØØ	(4300=Branch Instruction)
WRT	(Write 4300 at address 54)
DTA	
80	Address to branch to
WRT	(Write 0080 at address 56)
DTA	
7A	Select Address 7A
ADD	
DTA	
C732	This is the device number of the fixed platter disc. The removable disc is C633.
WRT	(WRITE C732 at address 7A)
DTA	
B6FØ	(Controller and Selch device numbers)
WRT	(Write B6FØ in address 7C)
DTA	
WRT	(Write ØØØØ in address 7E)
DTA	

J. HOW TO DUMP THE LOWER TO UPPER DISC PLATTER

DBA has installed on the system a DUMPD.CSS file. The procedure first uses the disc INITIALIZER program to clear the removable cartridge of all data. It then uses the DISC COMPRESS utility to compress the lower (fixed) platter to the upper removable (cartridge) disc. The user invokes the procedure by entering on TK1:

```
* DUMPD<CR>    (start the dump)
*
.
.
.
$COPY
$
$ DISC PUMP COMPLETE
$
$NØ
```

The full listing of the DUMPD.CSS file is shown in Table VI-2. When the dump is complete, the upper cartridge should be removed and stored.

TABLE VI-1. DUMP 12 CSS LISTING

LINE NUMBER	ENTRY	COMMENT
1	MA DS1:,OF	MARK CARTRIDGE OFF-LINE
2	LO DISCINIT	LOAD DISC INITIALIZATION
3	OP ET	SHOW ITS AN EXECUTIVE TASK
4	ST,DS1:,SYS1,CL,.SA	THE DISC VOLUME ID-SYS1.
5	MA DS1:,ON	MARK CARTRIDGE ON-LINE
6	LO DCMPØ1	LOAD DISC COMPRESS
7	OP ET	SAME AS LINE 3
8	ST,I-DSØ:,O=DS1:,L=TK1:,V	
9	$COPY	TURN COPY ON
10	$	
11	$ DISC DUMP COMPLETE	
12	$	
13	$NOCOPY	
14	MA DS1:,OF	MARK CARTRIDGE OF LINE
15	$EXIT	RETURN TO SYSTEM

SECTION VII

DATA FORMATS

SECTION VII
DATA FORMATS

A. INTRODUCTION

This section contains the raw data input/output formats for all VATTS unique devices. The true/false definitions are defined for each device as the data is viewed by the software. This definition is inverted on the data bus, i.e., when the encoders are disconnected, the signal shows up on the data bus as ground (Ø) but the computer displays all one's.

Any special conditions are noted on the device format.

B. RANGE INTERFERENCE UNIT (RIU)

The RIU is a multiplexor which collects data at a 20 pps rate. It is the collection point for all tracker data. The RIU input data format is shown in Table VII-1. The computer receives the 20 pps interrupt from the Time Code Generator via address 20 Hex. At this point, it enters the RIUISR software subroutines if interrupts have been enabled. The RIUISR then addresses the RTU strobing out each 16 bit word. Specifically, the software outputs the read command with the proper word address. The RIU collects that word, and waits for the computer to perform a read. The computer's instruction after the read word command, is to read data. The RIU places its data on the multiplexer bus and acknowledges the request for the READ. The computer receives the data word and stores it in memory. This same sequence is repeated until all necessary data words have been inputted.

C. ANALOG TO DIGITAL (A/D) INPUT

The INTERDATA 7/32 contains a standard ANALOG INPUT CONTROLLER. This board has 8 differential or 16 single ended inputs. The VATTS system is

TABLE VII-1. RIU INPUT DATA FORMAT

INTERRUPT ADDRESS: 20 HEX
DEVICE ADDRESS: 8B HEX

WORD	WORD	BIT NUMBER																BIT	
ADDRESS (HEX)	NUMBER	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL	SOURCE
										DAYS									
11	1	D_1	D_2	X	X	HUNDREDS					TENS				UNITS			16	TCG
		HOURS							MINUTES						SECONDS				
12	2	TENS			UNITS			TENS			UNITS				TENS			16	TGC
									MILLISECONDS										
13	3	UNITS				HUNDREDS				TENS					UNITS			16	TCG
21	4							AZIMUTH 16 LSB's										16	AZIMUTH ENCODER
23	5							ELEVATION 16 LSB's										16	ELEVATION ENCODER
24	6	X	X	X	X	X	X	X	AZ MSB	X	X	X	X	X	X	X	EL MSB	16	ENCODERS
1B	7	D_3	X	X	X	X	X			AZ ERROR								16	SERVO SYSTEM
1C	8	X	X	X	X	X	X			EL ERROR								16	SERVO SYSTEM
14	9						SPARE WORD											16	
22	10	D_4	D_5	D_6	X		HUNDREDS				TENS				UNITS			16	BCD DATA

X = DON'T CARE

D1 = ON-TIME BIT — 1 = ON-TIME
D2 = HOLD BIT — 1 = HOLD
D3 = ON/OFF TRACK — 1 = TRACK OFF
D4 = MTU ON/OFF — 1 = MTU ON
D5 = NARROW/WIDE — 1 = NARROW
D6 = AUTO TRACK — 1 = TRUE

NOTE: THE ENCODERS ARE DEFINED AS FOLLOWS:
MSB = 180°, BIT Ø = 90°, BIT 1 = 45°, ETC.
THUS ALL BITS ON = 359.999°

strapped for the 16 single ended inputs. Of these inputs, only the first 6 are used. This data is strobed at a 20 pps rate.

D. TRIGGER PULL INPUTS

DEVICE ADDRESS: 8B HEX

This device is an integral part of the RIU input data as described in Table VII-1. The word address is different to get the trigger pull data in.

Trigger pull input data format is as follows:

WORD ADDRESS																TP
2 HEX	X	X	X	X	X	X	X	X	X	X	5	4	3	2	1	Ø

E. LASER INPUT

Laser input information consists of 20 bits of range information broken up in 5 BCD words. The first four words are at Hex address 25. The fifth word is at Hex address 26. The first four BCD words gives 16 MSB of range. The fifth word gives the following information: 4LSB in tenths of range; 4 blank bits; 6 bits of range quality; 1 blank bit; an a LSB of range valid. Range valid is true when 16 up to 32 bits of return information is received by the laser receiver from the retro-reflector.

F. LOG TAPE OUTPUT FORMAT

The log tape is written when the buffer of 20 logical records is filled. The order and width of each field within one logical record is described in Table VII-2. The total length of a logical record is 112 bytes. There are 20 logical records per physical tape record, i.e., 20 X 112 - 2240 bytes, which is the byte count of a physical record. All data is in EBCDIC. The tape is written in IBM compatible mode, 800 BPI, odd parity, NRZI.

TABLE VII-2. LOG TAPE FORMAT

FIELD NAME - MAJOR/MINOR	LOCATION	COMMENTS	NO. OF BYTES	
TIME	1-11			11
DAYS	1-3		3	
HOURS	4-5		2	
MINUTES	6-7		2	
HUNDREDTHS	10-11		2	
TRACKER DATA				28
AZIMUTH	12-16	0-360	5	
AZ ERROR	17-20	± 999	4	
ELEVATION	21-25	± 90	5	
EL ERROR	26-29	± 999	4	
BCD THUMBWHEELS	30-32	999	3	
ON-TARGET	33	1=ON	1	
AUTO/MANUAL TRACK	34	1=AUTO	1	
NARROW/WIDE LENS	35	1=NARROW	1	
SPARE	36-39	0000	4	
MOTOROLA MINI-RANGER				
TIME	40-47			21
HOURS	40-41		2	
MINUTES	42-43		2	
SECONDS	44-45		2	
HUNDREDTHS	46-47		2	
TRANSPONDER ID	48		1	
TARGET ID	49-50		2	
RANGE A	51-55	99999	5	
RANGE B	56-60	2-WAY RANGE	5	
TRIGGER PULLS				18
TRIGGER PULL (TP)Ø	61-63	MILLISECONDS OF LATEST FIRING	3	
TP1	64-66		3	
TP2	67-69		3	
TP3	70-72		3	
TP4	73-75		3	
TP5	76-78		3	
ANALOG TO DIGITAL	79-102	BIASED BY 5000		24
A/D 0	79-82		4	
A/D 1	83-86		4	
A/D 2	87-90		4	
A/D 3	91-94		4	
A/D 4	95-98		4	
A/D 5	99-102		4	
ATAADS DATA	103-110	NOT DEFINED		8
X	103-106		4	
Y	107-110		4	
SPARE FIELDS TO INSURE MOD 4 RECORD LENGTH				2
		TOTAL		112

SECTION VIII

COPIES OF COMPLETE CSS FILE LISTINGS

```
HELP FILE AZEL PROGRAM
*THE FOLLOWING PROGRAMS ARE AVAILABLE TO THE VATTS OPERATOR
*CHANGE1
*CHANGE2
*VATTS
*VATTS2
*BACK1
*BACK2
*QUICK1
*QUICK2
*DUMP21
*DUMP12
*DUMP2
*DUMP1
*LONG1
*LONG2
*DELOG2
*DELOG
*CPYA
*CPYB
*DUPTAPE
*EDM --- has been subsequently deleted from HELP file.
*ECM --- has been subsequently deleted from HELP file.
$NOCOPY
*
```

```
CPYA CHANGE1.CSS,TK1:
OS COPY
$CO
*HIT RE-INITIALIZATION SWITCH TO CHANGE TO SYS1
*CHANGE SYS1 PROTECT SWITCH TO THE OFF POSITION
*CHANGE SYS2 PROTECT SWITCH TO THE ON POSITION
$NO
MOD 7A,C732
$EXIT
OS COPY
END OF TASK      0
```

```
CPYA CHANGE2.CSS,TK1
OS COPY
$CO
*HIT RE-INITIALIZATION SWITCH TO CHANGE TO SYS2
*CHANGE SYS2 PROTECT SWITCH TO THE OFF POSITION
*CHANGE SYS1 PROTECT SWITCH TO THE ON POSITION
$NO
MOD 7A,C633,B6F0,0000
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA VATTS.CSS,TK1:
OS COPY
RES CL
$CO
*
*MOUNT OUTPUT TAPE ON UNIT ONE (1)
$NO
**$IFX ERROR.MSG;DE ERROR.MSG;$ENDC
*AL ERROR.MSG,CH,80
LO FTKNOX
AS 1,TK1:
AS 2,NULL:;*ERROR OUTPUT LU
AS 5,CRT:
AS 9,MAG1:
OP ET
ST
RES CL
*D F,SYS2:ERROR.MSG
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA VATTS2.CSS,TK1:
OS COPY
RES CL
$CO
*
* MOUNT TAPE ON MAGTAPE UNIT NUMBER 2
*
$NO
*$IFX ERROR.MSG;DE ERROR.MSG;$ENDC
*AL ERROR.MSG,CH,80
LO FTKNOX
AS 1,TK1:
AS 2,NULL:;*ERROR OUTPUT LU
AS 5,CRT:
AS 9,MAG2:
OP ET
ST
RES CL
*D F,SYS2:ERROR.MSG
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA BACK1.CSS,TK1:
OS COPY
*THIS PROCEDURE BACKS UP SYS2 (DS0) WITH MAG1:
MA DS0:,OF
LO DISCINIT
OP ET
ST,DS0:,SYS2,CL,.SA
MA DS0:,ON
LO DCMP01
OP ET
ST,I=MAG1:,O=DS0:,L=TK1:,V
$CO
*
*SYS2 (DS0) BACKUP COMPLETE
*REMOVE TAPE FROM MAG1
$NO
MA DS0:,OF
$EXIT
$EXIT
OS COPY
END OF TASK      0
```

```
CPYA BACK2.CSS,TK1:
OS COPY
*THIS PROCEDURE BACKS UP SYS2 (DS0) WITH MAG2:
MA DS0:,OF
LO DISCINIT
OP ET
ST,DS0:,SYS2,CL,.SA
MA DS0:,ON
LO DCMP01
OP ET
ST,I=MAG2:,O=DS0:,L=TK1:,V
$CO
*
*SYS2 (DS0) BACKUP COMPLETE
*REMOVE TAPE FROM MAG2
$NO
MA DS0:,OF
$EXIT
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA QUICK1.CSS,TK1:
OS COPY
$CO
$THIS IS A QUICK CHECK FOR SYS1 (DISCHECK)
$MAKE SURE PROTECT SWITCHES ARE OFF ON THE DISC BEFORE
$THIS PROGRAM IS EXECUTED
$NO
AS 3,TK1:
OP ET
LO DISCHECK
ST ,DS1:,TK1:,CLOSE
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA QUICK2.CSS,TK1:
OS COPY
$CO
*THIS IS A QUICK CHECK FOR SYS2 (DISCHECK)
*MAKE SURE PROTECT SWITCHES ARE OFF ON THE DISC BEFORE
*THIS PROGRAM IS EXECUTED
*MAKE SURE YOU ARE ON SYS1, DS1
*TO DO THIS MA DS0:,OFF, THEN SET THE VOLUME *TO SYS1** V SYS1
*THEN MA DS1:,ON
$NO
AS 3,TK1:
OP ET
LO DISCHECK
ST ,DS0:,TK1:,CLOSE
$EXIT
OS COPY
END OF TASK     0
*
```

```
CPYA DUMP21 CSS,TK1:
J3 COPY
MA DS1 ,OF
LO DISCINIT
OP ET
ST,DS1:,SYS1,CL,.SA
MA DS1:,ON
LO DCMP01
OP ET
ST,I=DS0:,O=DS1:,L=TK1:,V
$CO
*
*  DISC DUMP COMPLETE
*
$NO
MA DS1:,OF
$EXIT
$EXIT
OS COPY
END OF TASK     0
*
```

```
CPYA DUMP12.CSS,TK1:
OS COPY
*THIS PROCEDURE DUMPS THE TOP DISC DOWN TO THE BOTTON DISC
MA DS0:,OF
LO DISCINIT
OP ET
ST,DS0:,SYS2,CL,,SA
MA DS0:,ON
LO DCMP01
OP ET
ST,I=DS1:,O=DS0:,L=TK1:,V
$CO
*
*  DISC DUMP COMPLETE
*
$NO
MA DS0:,OF
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA DUMP2.CSS,TK1:
OS COPY
RES CL
REW MAG1:
LD DCMP01
OP ET
MA DS0:,ON,PRO
$CO
*     DISC COMPRESS SYS2 TO MAG1
$NO
ST,I=DS0:,O=MAG1:,L=TK1:,V
$CO
*
* DUMP COMPLETE - REMOVE TAPE
*
$NO
RES CL
REW MAG1:
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA DUMP1 CSS:TK1
OS COPY
*THIS PROCEDURE DUMPS SYS1 TO MAG1
RES CL
REW MAG1
LO DCMP01
OP ET
MA DS1:,ON,PRO
$CO
*      DISC COMPRESS SYS1 TO MAG1
$NO
ST,I=DS1:,O=MAG1:,L=TK1:,V
$CO
*
* DUMP COMPLETE - REMOVE TAPE
*
$NO
RES CL
REW MAG1:
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA LONG1.CSS,TK1:
OS COPY
$CO
*THIS IS A COMPLETE CHECK FOR SYS1 (DISCHECK)
*MAKE SURE PROTECT SWITCHES ARE OFF ON THE DISC BEFORE
*THIS PROGRAM IS EXECUTED
$NO
AS 3,TK1:
OP ET
LO DISCHECK
ST ,DS1:,TK1:
$EXIT
OS COPY
END OF TASK      0
```

```
CPYA LONG2.CSS,TK1:
OS COPY
$CO
*THIS IS A COMPLETE CHECK FOR SYS2 (DISCHECK)
*MAKE SURE PROTECT SWITCHES ARE OFF ON THE DISC BEFORE
*THIS PROGRAM IS EXECUTED
$NO
AS 3,TK1:
OP ET
LO DISCHECK
ST ,DS0:,TK1:
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA DELOG2.CSS,TK1:
OS COPY
RES CL
LO DELOGP
$CO
*MOUNT MAGTAPE ON UNIT TWO (2)
*
$NO
AS 1,TK1:
AS 2,TK1:
AS 5,MAG2:
ST
RES CL
$EXIT
OS COPY
END OF TASK      0
```

```
CPYA DELOG.CSS,TK1:
OS COPY
RES CL
LO DELOGP
AS 1,TK1:
AS 2,TK1:
AS 5,MAG1:
ST
RES CL
$EXIT
OS COPY
END OF TASK      0
```

```
CPYA CPYA CSS,TK1:
OS COPY
* CPYA <FD1>,<FD2>[,FN OR **NNNNNNNN][,R][,N OR ALL][,F][,L]
$IFNULL @1;ERROR;$ENDC
$IFNULL @2;ERROR;$ENDC
CLOSE 1,2
ASSIGN 1,@1,SRO;ASSIGN 2,@2
CREATE COPY.CMD,72
$BUILD COPY.CMD
CPYA @3,@4,@5,@6,@7
END
$ENDB
ASSIGN 5,COPY.CMD
RUN OSCOPY
CLOSE 1,2,5
DELE COPY.CMD
$EXIT
OS COPY
END OF TASK     0
```

```
CPYA CPYB.CSS,TK1:
CS COPY
* CPYB <FD1>,<FD2>[,FN OR LLLLLLLL][,R][,N OR ALL][,F][,L]
$IFNULL @1;ERROR;$ENDC
$IFNULL @2;ERROR;$ENDC
CLOSE 1,2
ASSIGN 1,@1,SRO;ASSIGN 2,@2
CREATE COPY.CMD,72
$BUILD COPY.CMD
R126
CPYB @3,@4,@5,@6,@7
END
$ENDB
ASSIGN 5,COPY.CMD;RUN OSCOPY
CLOSE 1,2,5
DELE COPY.CMD
$EXIT
OS COPY
END OF TASK     0
*
```

```
CPYH DUPTAPE.CSS,TK1:
OS COPY
RES CL
LO DUPTAPEP
AS 1,MAG1:
AS 2,MAG2:
$CO
*
*TAPE DUP ROUTINE -- UNIT 1 TO UNIT 2
*
$NO
ST
RES CL
$EXIT
OS COPY
END OF TASK      0
```

```
CPYA AZEL.CSS,TK1:
OS COPY
RES CL
LO AZELRUN
AS 1.TK1:
AS 2.TK1:
AS 5.MAG1:
ST
RES CL
$EXIT
OS COPY
END OF TASK      0
```